TECHNOLOGY DEPT.

INDIA RUBBER WORLD

OUR
62nd YEAR

A BILL BROTHERS PUBLICATION

JANUARY 1951

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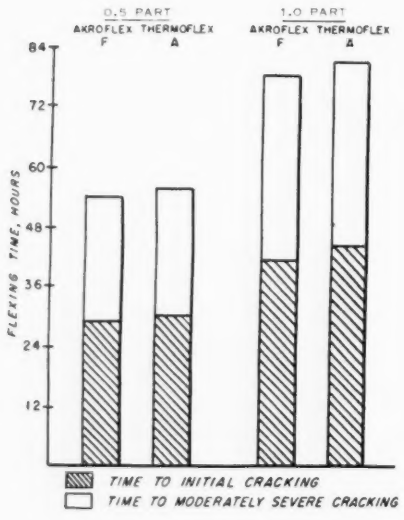
Get the most out of your **Natural Rubber**
in **HEAVY DUTY TRUCK and BUS TIRES**
with **Spheron-9**
Easy **P**rocessing **C**hannel *BLACK*
LOW HEAT GENERATION
HIGH ABRASION RESISTANCE
HIGH TEAR RESISTANCE
GODFREY L. CABOT, INC.
Boston 10, Mass.

FOR MAXIMUM PROTECTION at minimum cost use . . . . . Du Pont . . AKROFLEX F*

the new, flex-resisting antioxidant



With efficient, economical Du Pont Akroflex F you can obtain maximum protection against flex-cracking at minimum cost. The protective value of Akroflex F is essentially equal to that of Thermoflex A, long the standard of excellence among flex-resisting antioxidants. *Yet, Akroflex F costs one-third less than Thermoflex A.*

The bar graph shows the results of tests comparing the effectiveness of Akroflex F with that of Thermoflex A in a natural rubber tread compound. For practical purposes, the two antioxidants are equal. And results of road tests of 8.20 x 15 tires with "half and half" treads have confirmed that there is little or no difference between the two materials.

Remember, too, that Akroflex F is easy to handle in your plant. Its melting point is high enough to prevent caking in storage. Yet, it is low enough to assure excellent dispersion during mixing.

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Complete information on Akroflex F is available in our Report 50-4. Extra copies are available. For samples, see your Du Pont representative or write E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.

*U.S. PATENT 2,406,72

INDIA RUBBER WORLD, January, 1951, Vol. 123, No. 4. Published Monthly by BILL BROTHERS PUBLISHING CORP., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada $4.00; All other countries $5.00; Single Copies 35 Cents. Address Mail to New York Office

News about

B. F. Goodrich Chemical Company ***raw materials***

for improved, lower-cost rubber compounding—use

Good-rite
*REG. U. S. PAT. OFF.
RESIN 50

WITH this easy-processing reinforcing agent, you can make important savings on your rubber-compounding costs. Finished products will be improved, too.

Just see what Good-rite Resin 50 does! It provides a new compounding approach to hardness problems. For example, it's a simple means of filling in the gap between soft rubber compounds and ebonites.

It saves time by eliminating masterbatching. It gives rubber compounds better flex life, higher elongation, improved abrasion resistance. Compounds are more easily handled because Resin 50 acts as a plasticizer at processing temperatures.

For extruded shapes such as gaskets, tubing, coving, etc., particularly on hard compounds, Resin 50 provides improved surface smoothness and superior processing characteristics in the extruder.

Made as a white, free-flowing powder, Good-rite Resin 50 can be compounded in a wide range of colors. Find out how Resin 50 may help you improve your rubber compounding, save you money, too. For technical bulletins, please write Dept. CB-1, B. F. Goodrich Chemical Co., Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
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American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Process your stock this faster way... make tires and tubes with **Philblack* A!**

Down . . . down . . . down go production woes with Philblack A.

Up . . . up . . . up go production rates.

This easy mixing MAF (Medium Abrasion Furnace) black incorporates rapidly—stocks extrude with breath-taking speed. Surfaces are *sm-o--o-th*. Cross-sections match the die closely without roller coaster variations even at high tubing speeds.

Other advantages: Low heat buildup—low cut and crack growth—reduced chipping.

The Philblack Sales Service Laboratory located in downtown Akron is adequately staffed and equipped to analyze your compounding needs. Avail yourself of this service through the Philblack technical sales representative who calls on you.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING · AKRON 8, OHIO

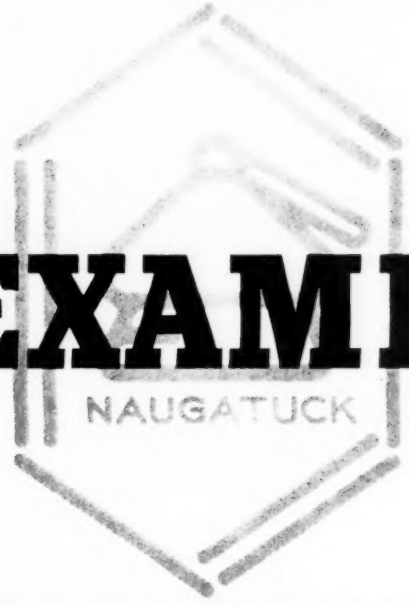
Phillips 66

Philblack A and Philblack O are manufactured at Borger, Texas.
Warehouses in Akron, Boston, Chicago and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

*A Trademark

In 1951

rubber products must last longer!



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COMPOUND WITH NAUGATUCK FLEXAMINE

- **IT ASSURES YOU** of maximum protection in both synthetic and natural rubber.
- **TIRE TREADS**—excellent resistance against heat, oxidation and outdoor flexing and static weather cracking.
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- **WIRE INSULATION**—inhibits deterioration caused by oxidizing action of copper and manganese.
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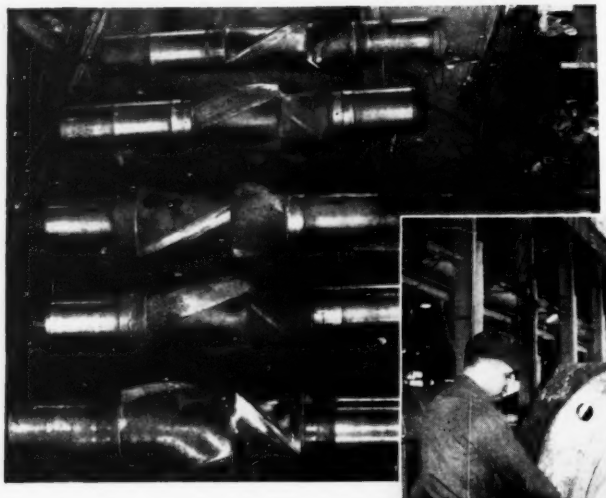
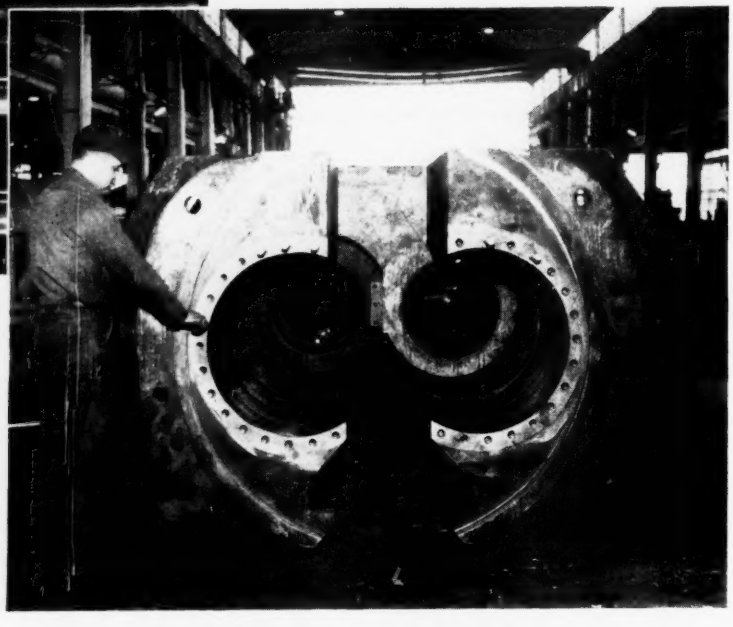


No. 27 ROTORS

In process of being rebuilt by Interstate.



No. 27 SIDE JACKETS

Rebuilt by Interstate. Jackets bored out and 2-inch high carbon steel sleeves inserted.

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From The Largest Size To The Smallest

INTERSTATE BANBURY SERVICE handles every size. In addition to our other facilities, we have at our command the full equipment of the Alliance Machine Company, one of the finest in the country.

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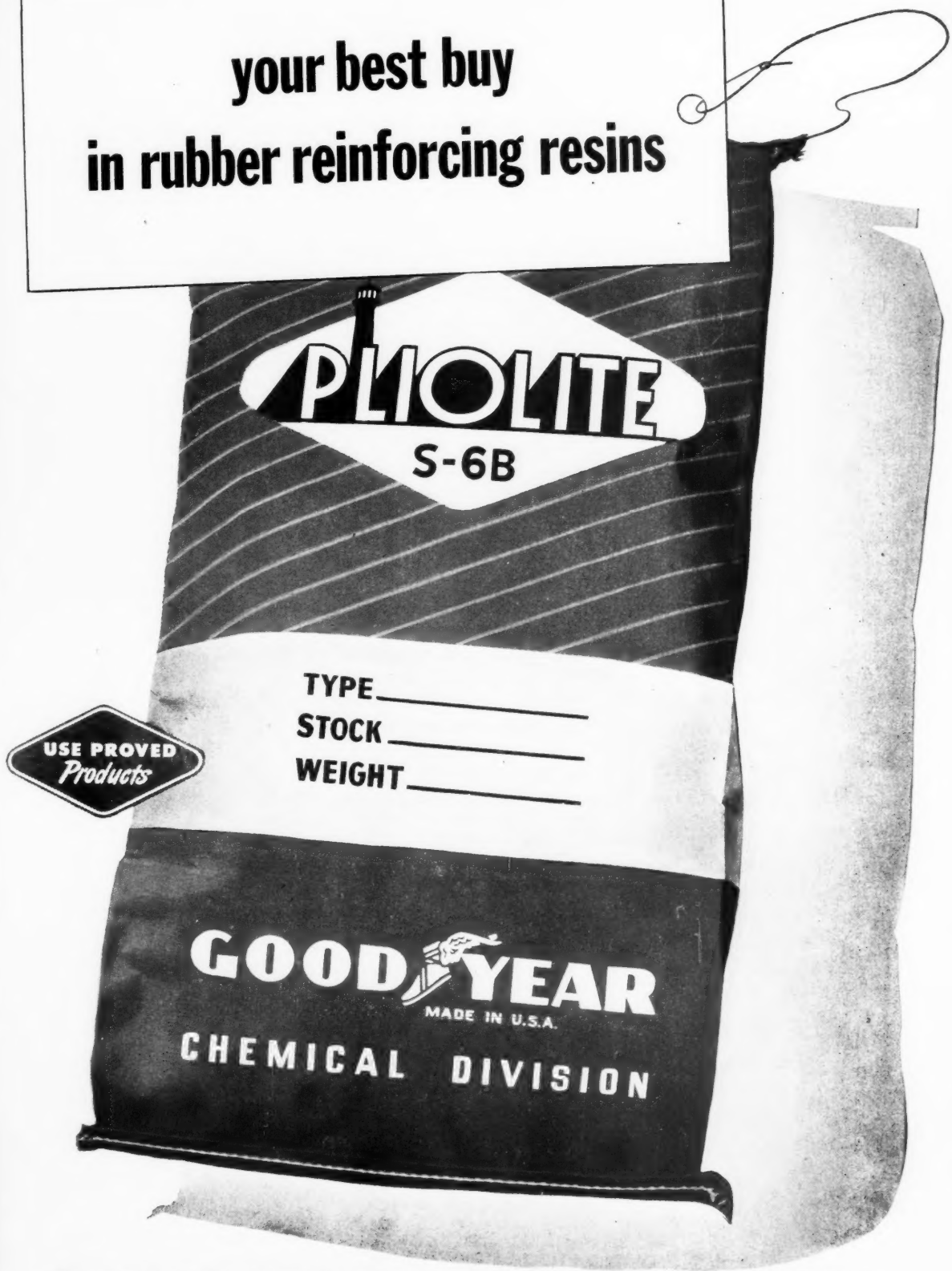

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Once again, General Electric leadership in the development of new silicone rubber compounds brings you a profitable new line of materials to help you make better—and different—products than ever before.

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- **Obtaining parts with high tensile, high elongation, high tear strength, and excellent electrical properties at high and low temperatures (550 F. to —85 F.)**
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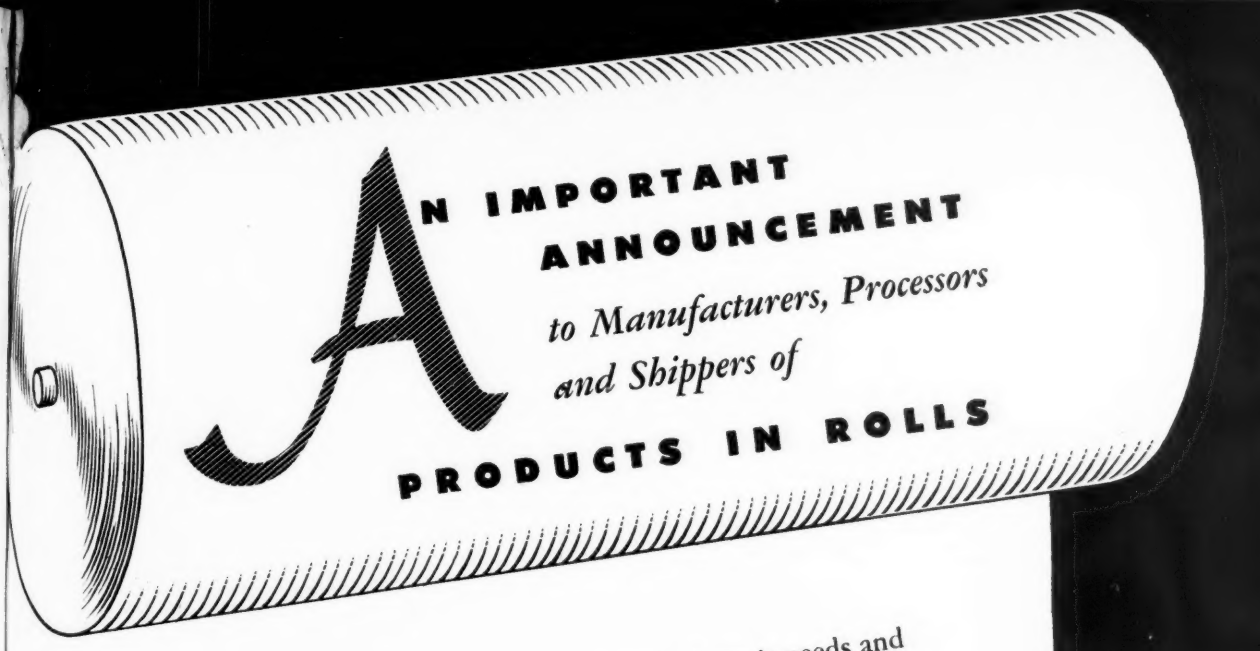
For more information about this remarkable new line of G-E silicone rubber compounds, just write to Section J3, Chemical Department, General Electric Company, Pittsfield, Massachusetts. (In Canada, Canadian General Electric, Toronto.)

Silicones for Industry

GENERAL ELECTRIC



AN IMPORTANT ANNOUNCEMENT

to Manufacturers, Processors and Shippers of

PRODUCTS IN ROLLS

After exhaustive surveys of the industry's needs and after long experimentation, our engineers have designed a line of Winding and Slitting machines which embody a number of important improvements.

Higher speed, less floor-space requirement and sturdier construction are only a few of the features which distinguish our machines from similar equipment available today.

These machines are now in production.

If your company is contemplating the purchase of Winding and Slitting equipment, to expand present facilities or to replace old-type, less efficient machinery, we suggest that you investigate the advantages and money-saving features of our new Winders and Slitters.

Bagley & Sewall's hundred year experience and outstanding record in designing and building this type of equipment is your advance guarantee of complete satisfaction.

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EASY DISPERSION for you...

*—when you use "Dutch Boy" **PLUMB-O-SIL C** to stabilize translucent **vinyl stocks** against heat and light*

PLUMB-O-SIL C is the newest addition to the "Dutch Boy" line of stabilizers for vinyl chloride polymers and copolymers.

Plumb-O-Sil C is a coprecipitate of lead orthosilicate and silica gel. It brings you the excellent stability and other advantages of lead silicate-silica gel complexes *plus a hitherto unattained degree of dispersibility.*

Its easy dispersibility pays off in easier processing. No longer is there any need for you to pre-disperse the stabilizer in your plasticizer.

And since its refractive index of 1.58 coincides so closely with that of vinyl chloride compounds (1.58-1.60), you're sure of a highly translucent product. In addition to guaranteeing translucent stocks, Plumb-O-Sil C makes it possible to achieve good stability in deep shades and vivid colors, for this stabilizer performs well with the majority of dyes and colorants.

Like all "Dutch Boy" products, Plumb-O-Sil C is backed up by the solid reputation of the maker — National Lead Company — assurance of a uniform quality, a stable product, a steady supply.

Our technical staff will be glad to help you stabilize vinyl resins for any use. Write for complete information on Plumb-O-Sil C or any other stabilizer in the ever-expanding "Dutch Boy" line.

Dutch Boy PRODUCTS

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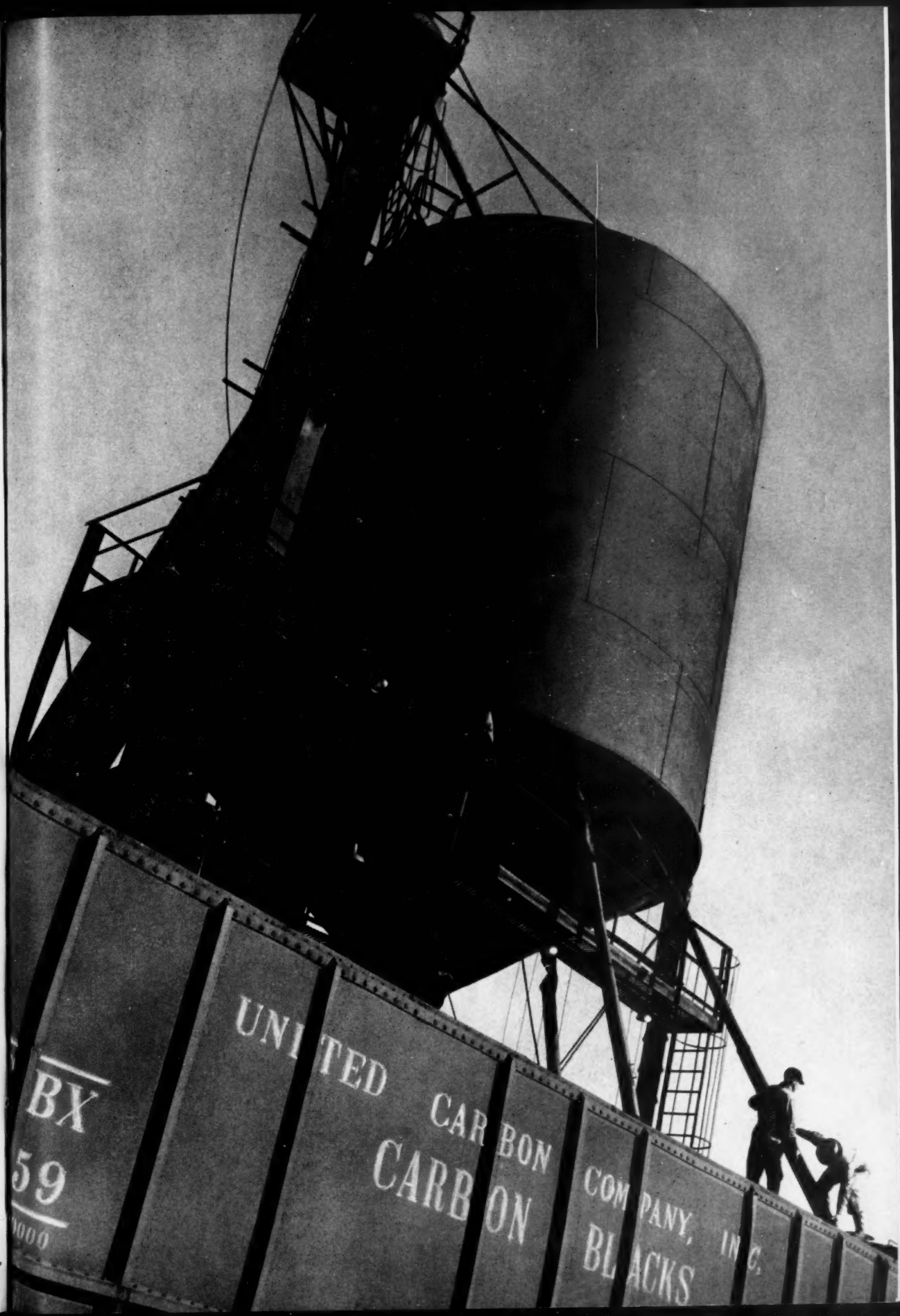
UNITED CARBON
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United channel blacks command attention. They are made with the skill acquired through decades of experience in carbon black manufacture. Their handling qualities are a boon to compounders and operators. Their service performance evokes highest satisfaction.

United channel blacks are standards of quality. They are dependable and uniform. For best results, select United blacks.

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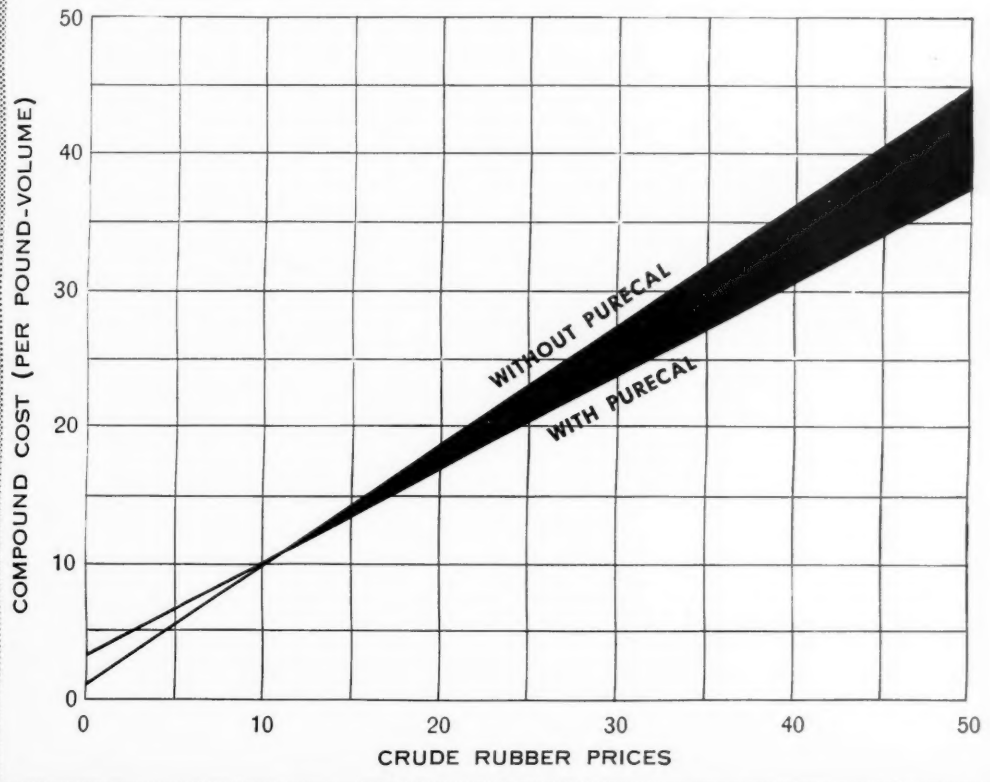
Charleston 27, West Virginia

Purecal U Cuts Compound Cost



TAKE another look at that chart. It will show you exactly how much you save by using Purecal* U as an extender. You'll notice the savings begin at a fraction of a cent when crude rubber costs 11 cents per pound. You'll notice, too, that those savings can climb to three . . . four . . . five . . . even seven cents per pound-volume depending upon the price of crude rubber.

But that's only part of the story. In the formula on which this chart was based, Purecal U: (1) increased tear resistance 100%, (2) decreased curing time 75%, (3) maintained original "pure gum" tensile properties and hardness.

It will pay you to get acquainted with Purecal U. In this period of rising prices, the advantages of Purecal are bound to become more and more considerable. Write for the free booklet: "PURECAL IN NATURAL RUBBER."

*Trade-mark

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White and tinted insulations of latex, vinyl or polystyrene are greatly improved through the use of TITANOX pigments. TITANOX-RA, for example, is not only compatible with all the above compounds but imparts exceptional whiteness or increased opacity which yields bright, clear tints. Furthermore, TITANOX pigments, because of their stability and dielectric characteristics, contribute to the electrical value of the insulation.

Our Technical Service Department is always available to help you with your problems in pigmenting all types of natural and synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 1; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Ltd., Montreal 2; Toronto 1.

8769

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the brightest name in pigments

TITANIUM PIGMENT CORPORATION
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. . . in spite of military demands!

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Trenton agent: H. M. Royal, Inc., 689 Pennington Ave., Trenton, N. J.

68 years serving the industry solely as reclaimers

U.S. RUBBER RECLAIMING COMPANY, INC.

It's 10 to 1 you'll re-order

GILSOWAX B

after one trial!

Here's why—

1. Plasticizes
2. Extends
3. Gives excellent dielectric properties
4. Gives high tensiles
5. Gives high flex-cracking resistance
6. Smoothes processing
7. Gives excellent aging characteristics
8. Reduces permanent set
9. Imparts acid resistance
10. Reduces sagging of uncured stocks

GILSOWAX B is an odorless, non-toxic, brownish-black, friable solid resin. It is a blend of gilsonite selects and microcrystalline and paraffin waxes, which combine to furnish rubber compounders with one material so versatile as to enable it to replace a number of products, each used individually to obtain one specific property. Gilsowax B is a moderate priced resin, shipped as a solid and is easily handled in the plant.

GILSOWAX B has no apparent effect on cure and can be used in neutral as well as black stocks. It can be used with natural, synthetic or reclaimed rubber, or with any blend of the three.

Send for your sample today!

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Improvements in operating techniques and in the design of the machine itself have resulted in greater uniformity and higher quality of mixes produced. Better production layouts have practically eliminated the manual handling of stock from the compound room and to succeeding machines.

THERE IS ALWAYS SOMETHING NEW in Banbury Mixer Design

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BANBURY MIXERS
TABLE OF CONTENTS
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For mixing stiffer stocks at higher speed
New set-ups are described
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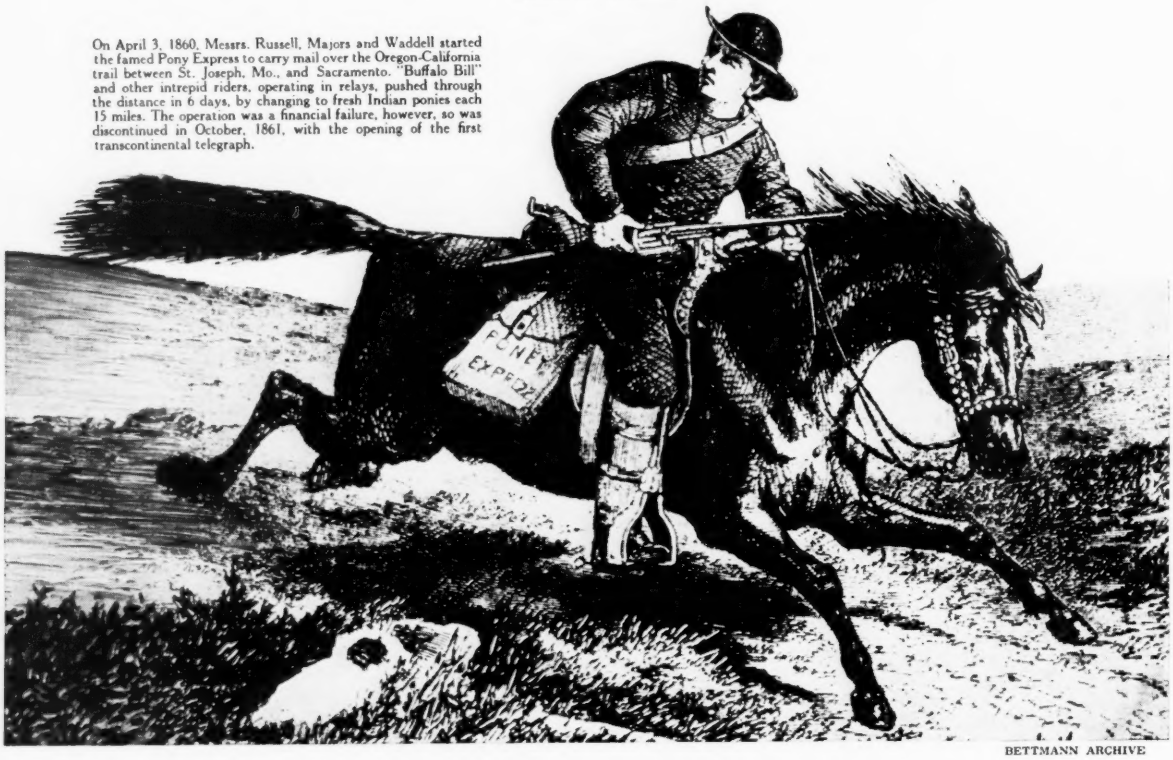
FB-640

PIONEERS OF THE CENTURY

(THIRD OF A SERIES)

On April 3, 1860, Messrs. Russell, Majors and Waddell started the famed Pony Express to carry mail over the Oregon-California trail between St. Joseph, Mo., and Sacramento. "Buffalo Bill" and other intrepid riders, operating in relays, pushed through the distance in 6 days, by changing to fresh Indian ponies each 15 miles. The operation was a financial failure, however, so was discontinued in October, 1861, with the opening of the first transcontinental telegraph.



BETTMANN ARCHIVE

1860 - PONY EXPRESS

THE Pony Express organizers, like many other pioneers, learned the wrong way that business ventures can succeed only so long as they keep pace with technologic progress.

In those years none were more aware of this than the thirty or so small companies that comprised the embryo rubber industry. Doubly difficult was their task of creating a variety of rubber articles that would not become sticky in hot weather nor brittle in the cold. For it required the simultaneous development of two new industrial arts: (1) vulcanization and (2) compounding finely-divided powders, such as Zinc Oxide.

Those early compounders appreciated many of the properties that Zinc Oxide imparts to rubber, as is evident from patents and technical literature of those days. A published recipe for an engine packing of that period, for example, showed the use of 53 parts of Zinc Oxide to 100 parts of rubber:

ENGINE PACKING—ABOUT 1860

Para rubber	25 parts
Java rubber	5
Zinc Oxide	16
Magnesia	6
China clay	3
Red lead	2
Sulfur	1⅞

Even in the light of modern formulating practice, that recipe represents an excellent compound based on inorganic acceleration.

To assist those compounders, The New Jersey Zinc Company early developed a brand of Horse Head Zinc Oxide especially adapted for use in rubber.

For over a century, The New Jersey Zinc Co. has continued to pioneer outstanding developments, many of which have helped speed the progress of the rubber industry

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Most used by the rubber industry since 1852

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Available in *three forms* to meet your particular factory and compounding requirements.

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SA 57-1 Powder form, treated with 3% mineral oil to reduce dusting and improve dispersibility in mill-mixed stocks.

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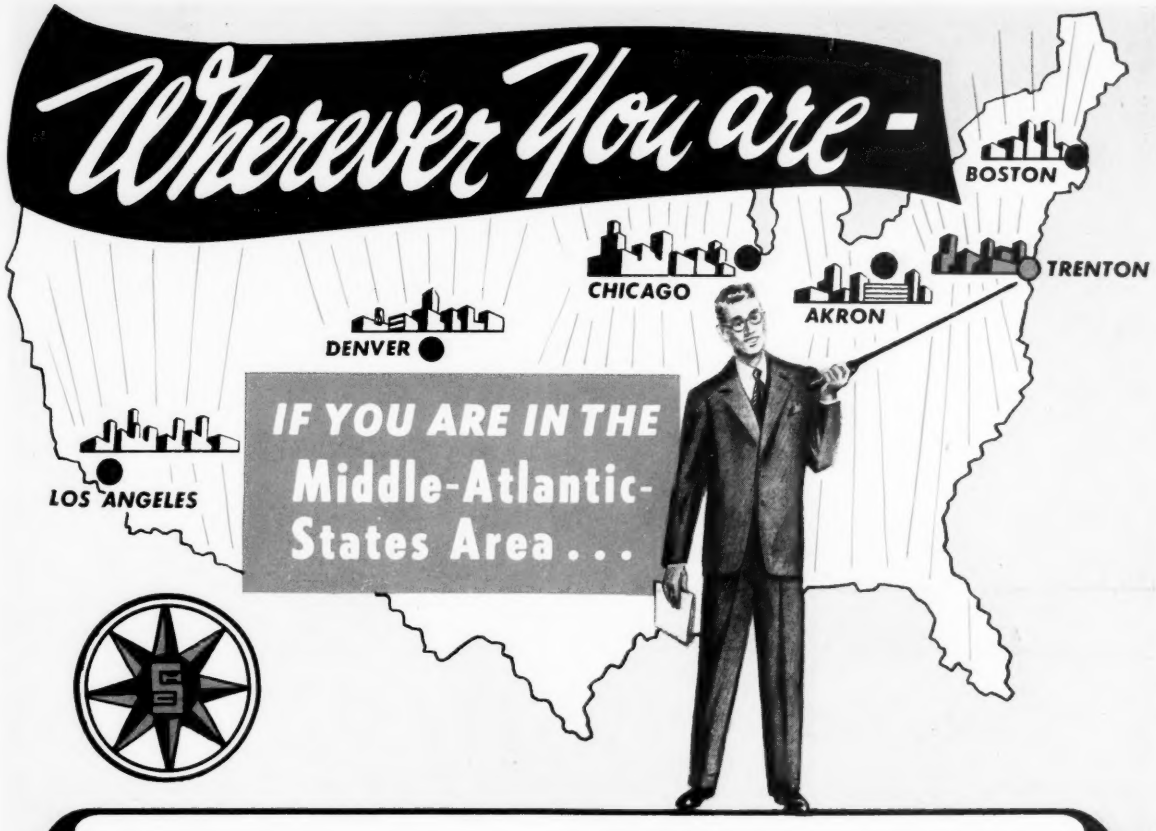

Wherever you are, technical sales representatives of the Harwick Standard Chemical Company's national organization are available quickly to help you on compounding or production problems . . . They can give suggestions on cost-saving developments — and may have the answer for you right now on the procurement of hard-to-get materials . . . They are picked men of training and skilled experience who *know* compounding and production.

PRODUCTS . . . SYNTHETIC RESINS: Para Coumarone Indenes, Hydro Carbon Terpenes, Piccolastic (Styrenes) . . . **COLORS:** Plastic dispersed, Dry Powder, Rubber Inks . . . **SOFTENERS:** Resinous, Liquids . . . **FILLERS:** Silene E. F., Clays, Whitings . . . etc.

OUR BRANCH IN TRENTON . . . is conveniently located at 901 Broad Street Bank Building — Telephone: 4-3137 — and provides warehouse facilities for quick service of supply on most products in the Harwick Chemical line . . .

R. J. Salyerds, Manager, is a graduate chemist with factory and laboratory experience on compound development. His understanding of production and compounding problems can be helpful in answering your problems on product development and production.

R. E. McElroy, Technical Representative, is a graduate chemist with factory experience in compound development and production . . . He is ready to serve you at any time.

• *Let us demonstrate this service from Akron, Boston, Chicago, Denver, Los Angeles or Trenton . .*

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AKRON, OHIO

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→ **RELIABILITY**

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→ **CONTINUOUS SUPPLY**

→ **FAIR PRICES**

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Emery's 110 years of fatty acid experience is your assurance of absolute uniformity and precise adherence to your demands shipment after shipment. You can look to Emery's continuing research and development of processing methods to bring you the *finest* in fatty acids *first*.

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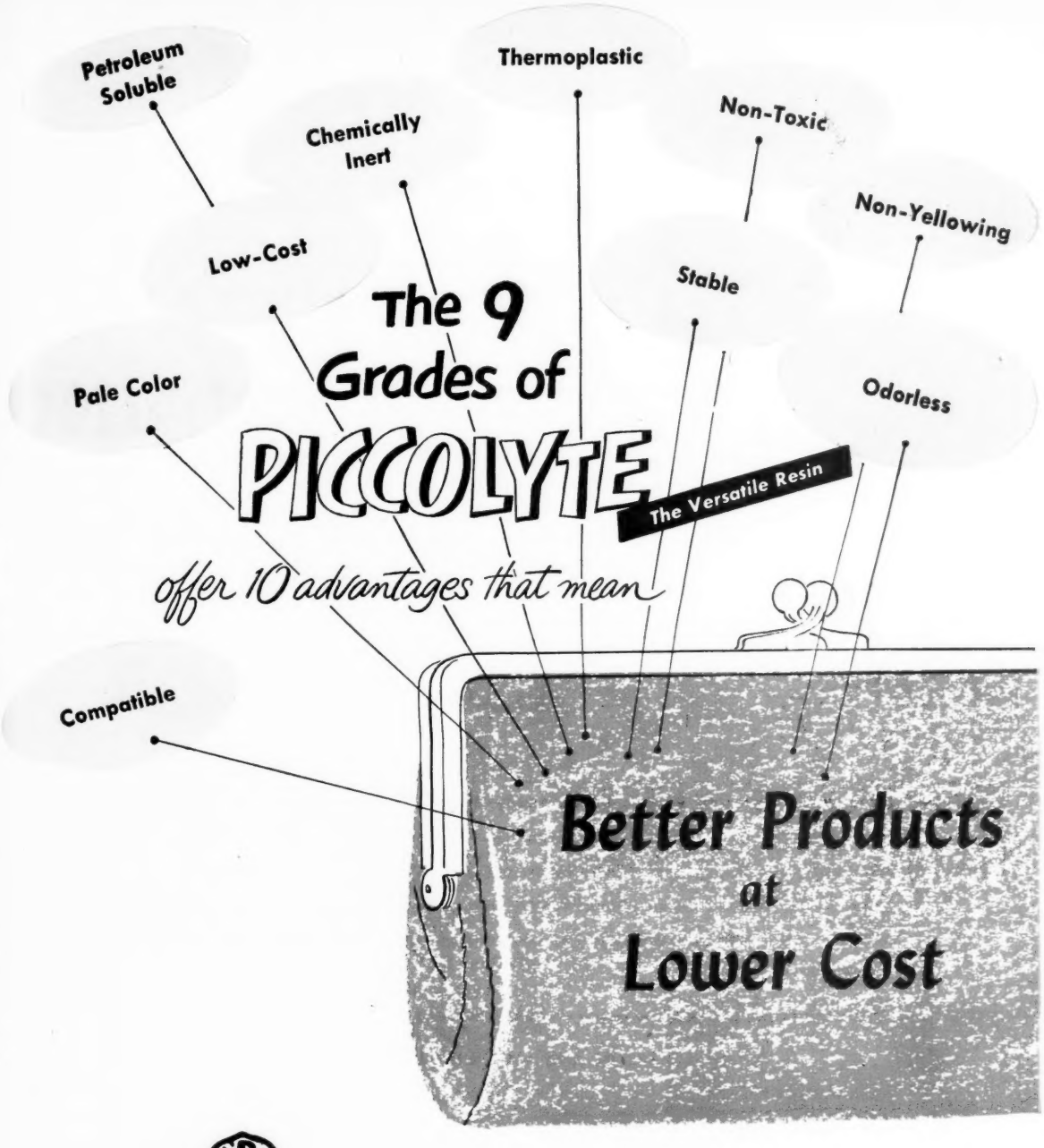

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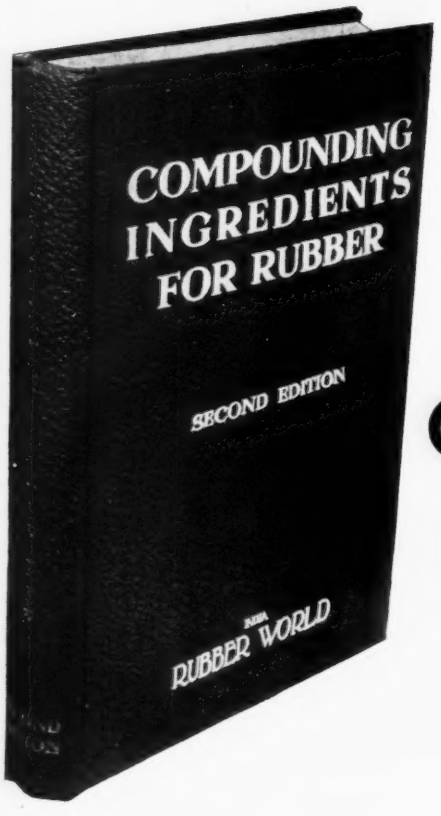

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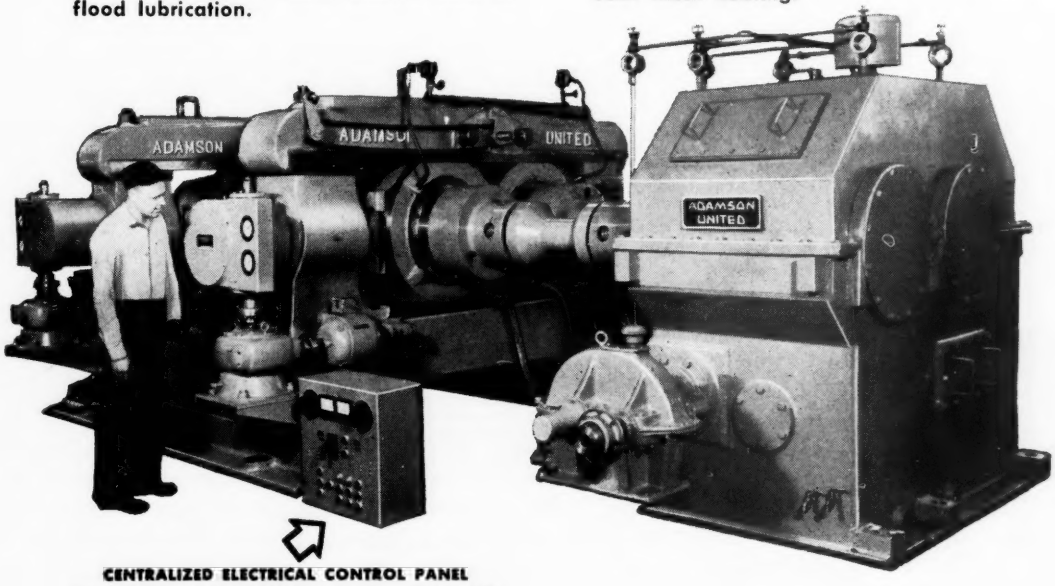

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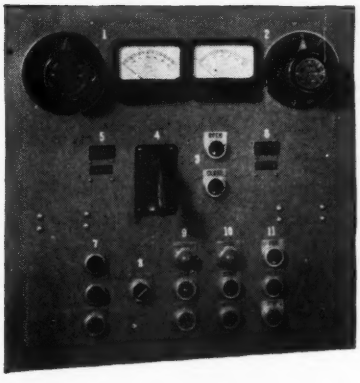

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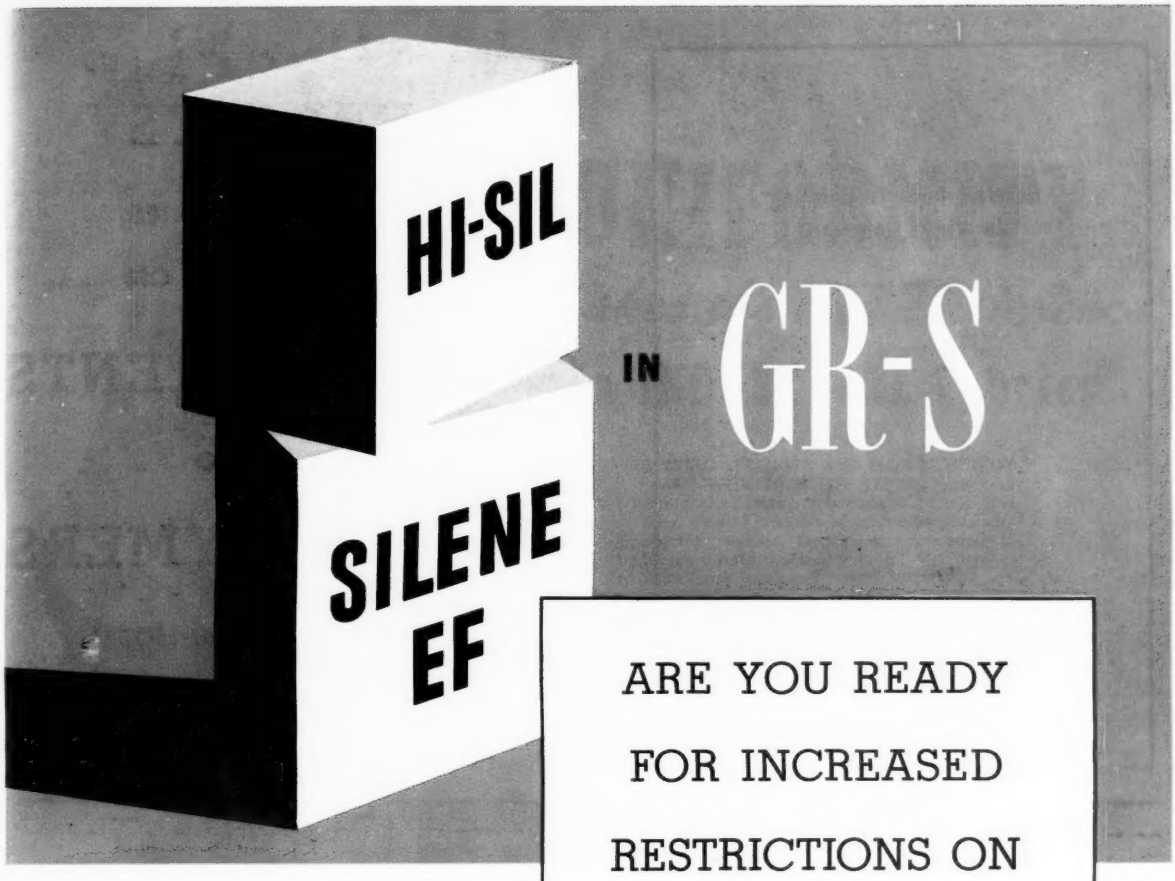

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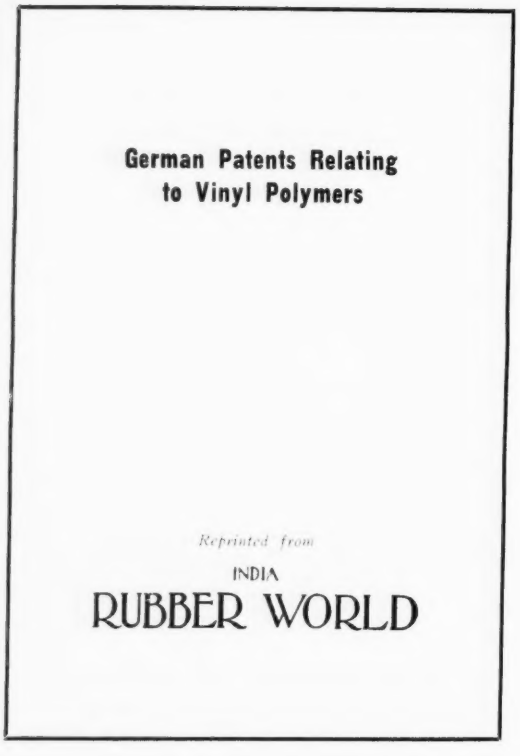

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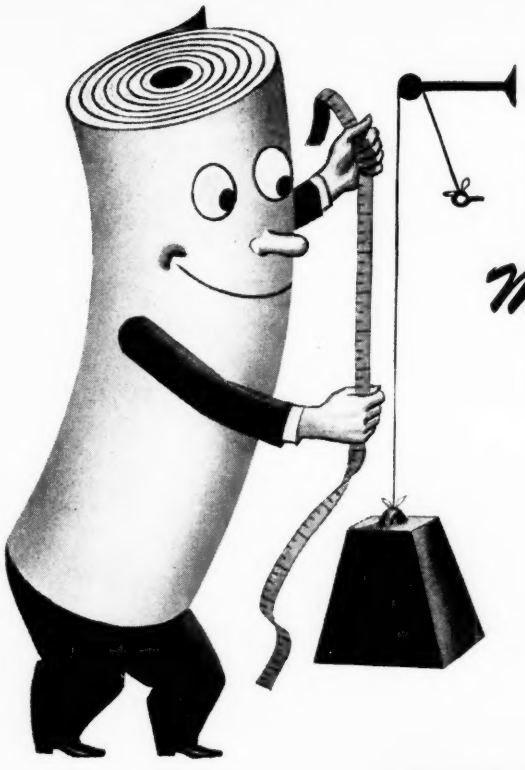

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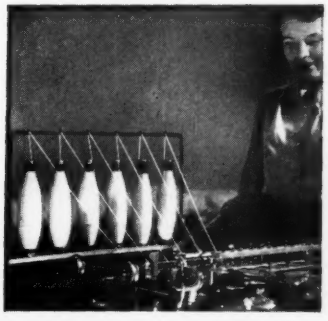

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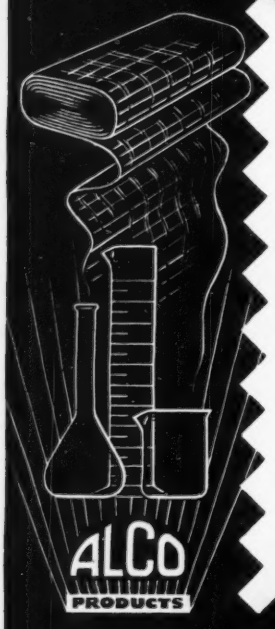

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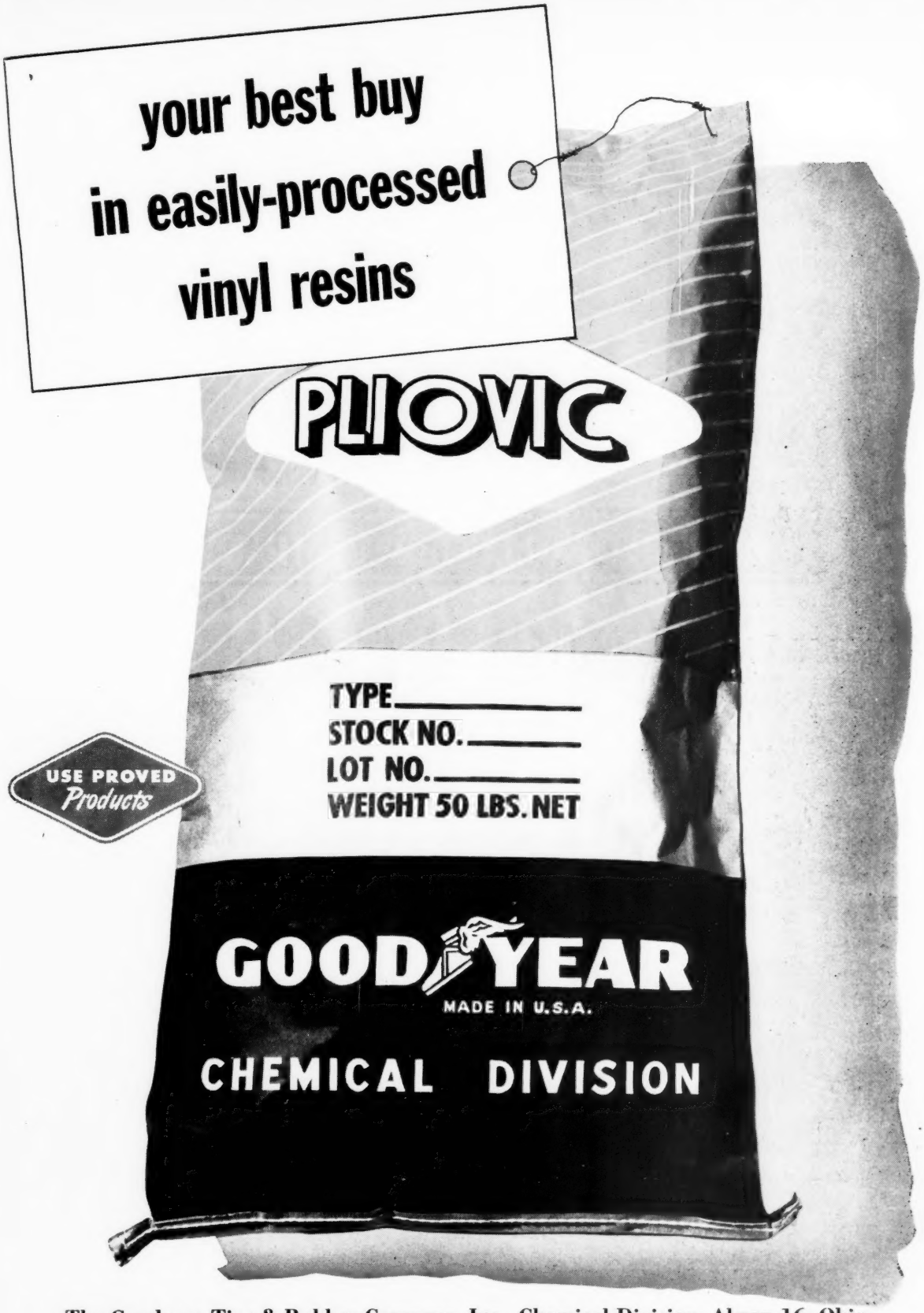

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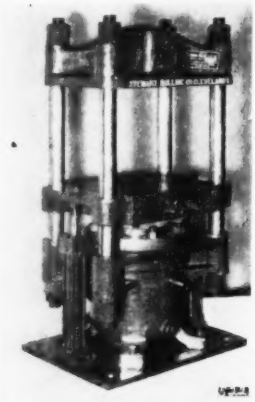

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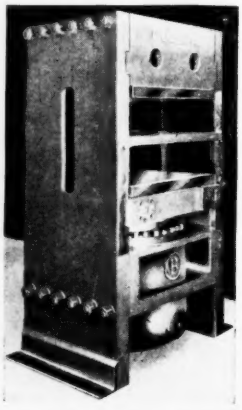

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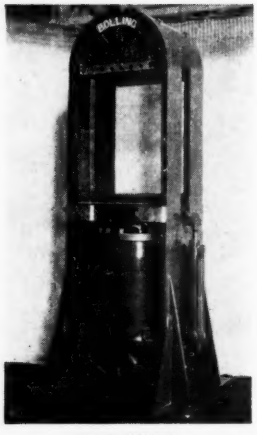

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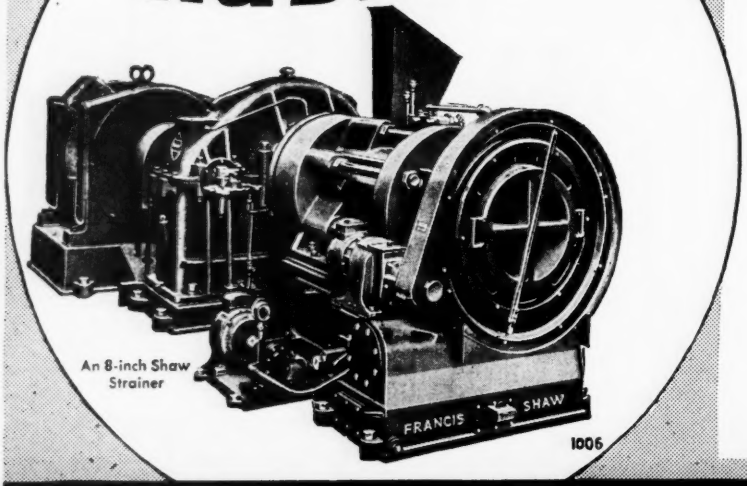

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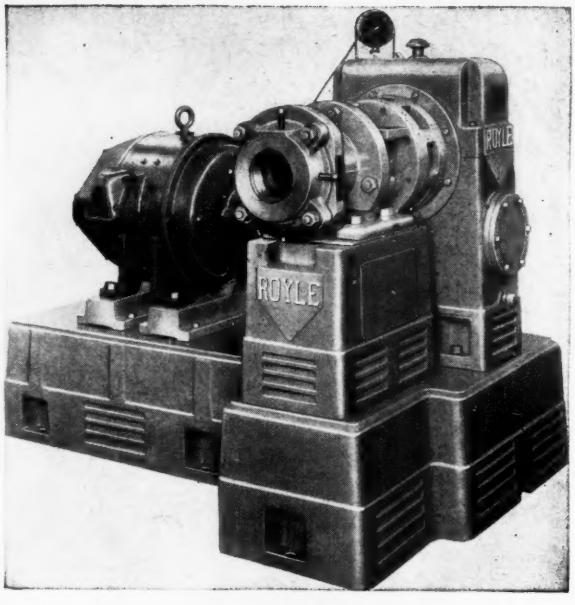

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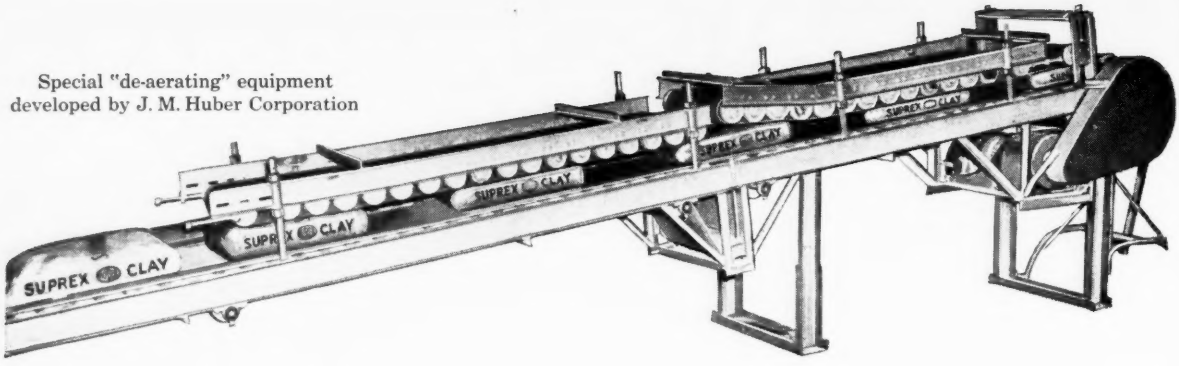

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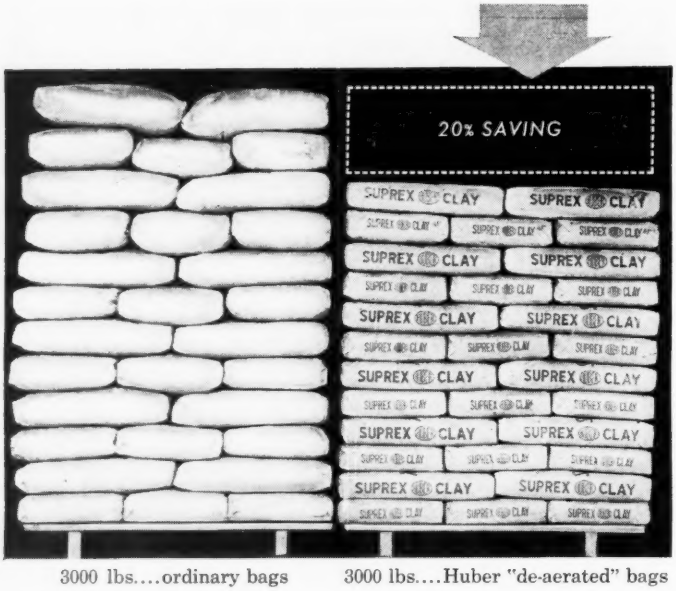

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RUBBER WORLD

A Bill Brothers Publication

JANUARY, 1951

Vol. 123—No. 4

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VOL. 123 — NO. 4 JANUARY, 1951

Some of the Real Pioneers of the Rubber Industry[1]

C. C. Davis[2]

WHEN these Goodyear lectures started, the talks lasted about as long as a good long cure; since then, they have tended to become shorter, and recently one came down to about the length of a modern ten-second cure. As far as subjects are concerned, we have had discussions on history, on science, and on technology, and perhaps the list will grow longer.

It has seemed to me that it might be in order to spend a little time on what to many of us appear as the outstanding contributions to the rubber industry since the time of Goodyear, and on some of the almost forgotten pioneers who are responsible for these achievements.

Your first reaction will probably be that there is nothing very new or exciting about this, and that you can turn to your library and find practically everything I am going to say. But I wonder if the stories of some of these pioneers are actually so readily accessible; in fact, I am going to mention a few things which you will not be able to find in print anywhere.

For example, how many of you are familiar with Rowley, Marks, Boggs, Molony, Moureu, and others whom I shall mention? Today the big rubber and big chemical companies are the ones who are doing the major share of the laboratory research and development work, and the day has come when we depend to a large extent on these companies for the success of our meetings of the Division of Rubber Chemistry, A. C. S. In fact, the time has arrived when the small companies are the ones that need prodding to arouse them into more and better contributions to these meetings, and to rubber chemistry and technology in general.

So it is easy to forget that some of the contributions which have meant most have come from almost forgotten pioneers, working quietly and patiently, in some cases without financial security, with no daily press interested enough to herald their accomplishments, and no rubber journals to record them.

I might add that we are not exactly encouraged to remember these pioneer workers by our advertising departments, who never cease to bombard us with the achievements of their own companies. For example, an advertisement appeared last year in which the manufacturer claimed:

(1) The first rubber research laboratory.
(2) The first rubber fire hose.
(3) The first use of accelerators to shorten the time of vulcanization.
(4) The first use of carbon black to make rubber tougher.
(5) The first use of age resisters to give rubber longer life.
(6) The first tires of American-made rubber to be sold.
(7) The fundamental development work on cold rubber.
(8) The first belting to outwear steel.

Obviously, most well-informed technical men would feel that several of these claims are, to say the least, questionable.

Then listen to this one about hose, which claims, after a great outpouring of rhetoric, "the first major development in steam hose construction in fifty years." How is that for exaggeration? And how do I know that it's an exaggeration? Because it's an ad of my own company.

If we were to make a list of the contributions which have, perhaps, had the greatest influence on the growth and standing of the rubber industry, and above all on the quality and price of rubber goods today, we might select the following:

[1] Presented before Division of Rubber Chemistry, A. C. S., Cleveland, O., October 12, 1950. This paper was Goodyear Medal Award Lecture for 1950 of the Division.
[2] Editor, *Rubber Chemistry and Technology;* chief chemist, Boston Woven Hose & Rubber Co., Cambridge, Mass.

Vulcanization.
Plantation Rubber.
Acceleration.
Reenforcement.
Reclaimed Rubber.
Dependable Aging.
Synthetic Elastomers.
Cooperation.

This may seem like trying to make up an all-star football or baseball team, where the experts never quite agree. Some might like to add the roll mill, the Banbury, the calender, continuous high speed curing, curing without sulfur, vulcanized latex, the cord tire, or even the first rubber chemist. But to keep the list within the limits of a short discussion, these eight milestones have been chosen as perhaps the most important of all on our highway of progress.

Vulcanization

In Figure 1 we see a reproduction (1)[3] of a contemporary painting of Charles Goodyear, in commemoration of whom these lectures were established. The greatest contribution of all to the rubber industry, vulcanization, or more strictly, hot vulcanization with sulfur, was the work of this untiring individual in his own home. Goodyear had no business connections, and he lived in a small town in the early 1800's. That he worked in none of the atmosphere of modern industry is shown not only in Figure 2, which depicts in legendary style Goodyear's great discovery (2), but also by Figure 3, a picture (3) of Goodyear's town, Woburn, Mass., at the time of his epoch-making discovery. In fact, we can readily imagine the gentleman in the carriage to be Mr. Goodyear hurrying back home with some sulfur from the apothecary shop.

Not far from this scene in Montvale, on the outskirts of Woburn, was the house in which Goodyear worked,

[3] Numbers in parentheses refer to Bibliography items at end of this article.

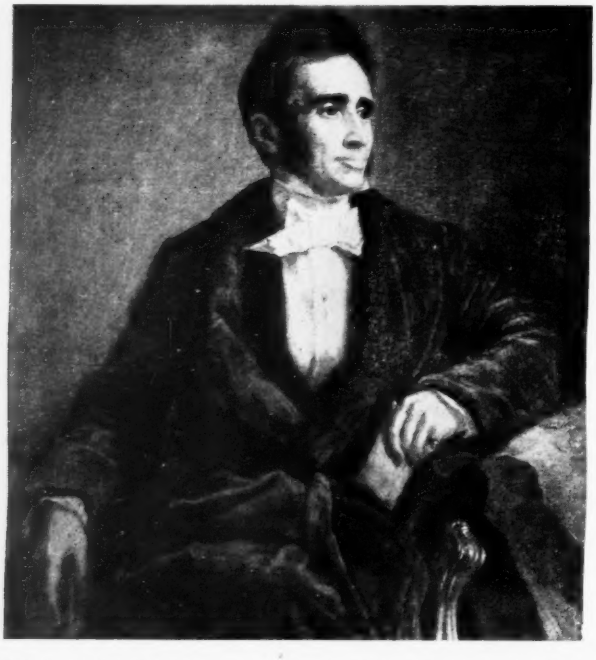


Fig. 1. Charles Goodyear, from the Painting by G. P. A. Healey

Fig. 2. Goodyear Discovers Vulcanization

a house still standing and occupied, and shown in its present state (4) in Figure 4.

But today no placard, no marker, no indication whatsoever tells the passerby that this is truly an historic house, far more worthy of honor and preservation than many another house of greater fame but less significance. If only the Rubber Division were in a position to acquire this historic house and bequeath it to the Society for the Preservation of New England Antiquities; or at least arrange to have the house or the grounds provided with a plaque or commemorative tablet identifying this historic rubber laboratory.

That Goodyear's own townspeople did not foresee the fame of their fellow man, even fifty years later, is evident from a standard history of Woburn (3) published in 1892. In a chronology of important events, we find such items as the following:

1837. Fourth financial panic.
1838. Warren Academy burned.
Baptist Church organized.
1839. "Woburn Sentinel," first newspaper, commenced.
Town voted $1200 for schools.
1840. Population 2993.
North Woburn library founded.
Congregational Church built.
Woburn Gazette commenced.
Fifth Meetinghouse dedicated.
Art of vulcanizing rubber discovered by Goodyear at Montvale about this time.
1841. Fowle Tavern taken down.
Town raised $7386 for the year.
1842. Population about 3000.
Town 200 years old.
1843. Gamblers tried in Baptist vestry.
Wild pig hunt.
Great comet appeared.

Note the country-wide panic which hit Woburn in 1837, just before Goodyear's discovery in 1839. This probably did not help in any efforts he may have been making toward financial backing in his work. The chronology then passes through 1839, with no mention of poor Goodyear. Is it possible that the town was not even aware that one of its residents had something great? Not until 1840 do we find Goodyear mentioned. So, in spite of his having made known his discovery in 1839 by his famous memoirs (5) and by his patents, an historian of his own town is so little impressed, 50 years later, by Goodyear's accomplishment that the best he can do is to guess at the date and then miss by a year. Note also the wild pig hunt, which in the chronology seems to rate with Goodyear's discovery in importance. I wonder if Goodyear found time to go on this affair.

What a year 1839 really was, not only as the year of Goodyear and his discovery, but also of another momentous accomplishment, the invention of photography. And if vulcanization and photography are not enough, let us recall in a lighter vein that the baseball diamond was designed, and the new game developed in 1839. All are now parts of our daily life, and it matters little which anyone may consider the greatest; in any event, it would be hard to find another single year in all history which can show such a record.

Our first great event, then, the very foundation of the rubber industry, was the work of an untiring obscure worker, paid by no one, supported by no one, encouraged by no one. Even today the public is so little interested in Goodyear that we still have no Goodyear in our Hall of Fame of great Americans.

Incidentally, I have spent this time on Goodyear in part because, after all, these Goodyear lectures are in honor of Goodyear himself, and I felt that it was only fair to devote a little time to the man.

Some of you are perhaps wondering why I have seemingly ignored Hancock, mention of whom I am confining merely to the picture (2) shown in Figure 5. Hancock was surely one of the most extraordinary men ever to grace our rubber industry, but a stop must be made somewhere. Hancock was possessed of a rare combination of technical imagination, business ability, untiring energy, and opportunism, and his accomplishments are almost unparalleled in the industry. So, in passing, I am glad of the opportunity to pay tribute to this remarkable man.

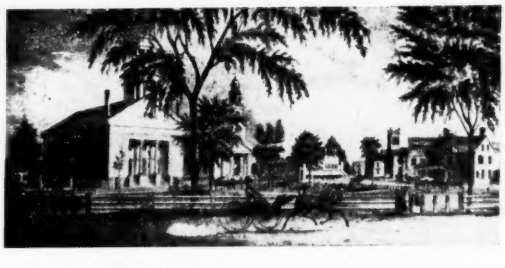


Fig. 3. Historic Woburn in the Days of Goodyear

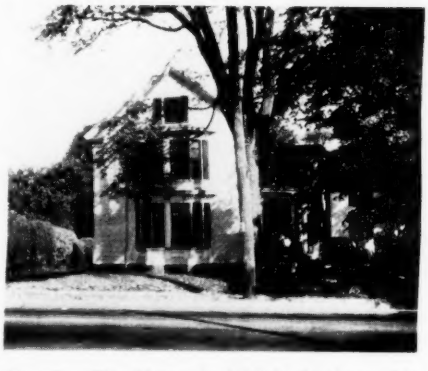


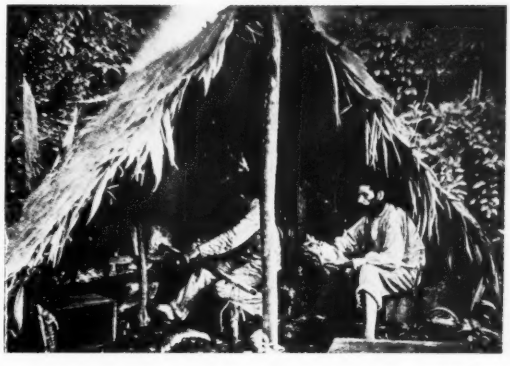
Fig. 4. The House in Which Goodyear Discovered Vulcanization

(Right)

Fig. 5. Thomas Hancock

(Below)

Fig. 6. Preparing Rubber for the Market in the Early Days of This Century



Plantation Rubber

Now we come to *Plantation Rubber*. This is one subject where a round-table discussion would not, as do baseball and politics, bring forth the old timers who long for the good old days when rubber was better and troubles were fewer.

Glance back at what our industry had to contend with, as can be seen, for instance (6), in Figure 6. Some of you may know what I mean when I add that worse and more intimate scenes that these could be shown for the benefit of those socialogically inclined.

Since the rubber did not get dirty enough under these primitive conditions, examine Figure 7, and see rubber being cut up, inspected, and packaged on dirty sidewalks and streets (7).

Another typical case is illustrated in Figure 8, which comes from an actual set of instructions (8) to small producers and shows a picture of how *not* to dry rubber, which advises them *not* to trample their rubber on the ground to squeeze out water, and particularly *not* to lay it on the road for motor cars to roll over, as you will note has been done in the picture. This practice, the instructions tell us, is likely to "make the rubber very dirty."

Some rubber had so bad an odor that it had to be opened outdoors with the wind in the right direction. One lot would cure fast; the next lot of supposedly the same

Fig. 7. Sampling, Sorting, and Packing Rubber in Brazil in the Early 1900's, a Guarantee of Dirty Rubber

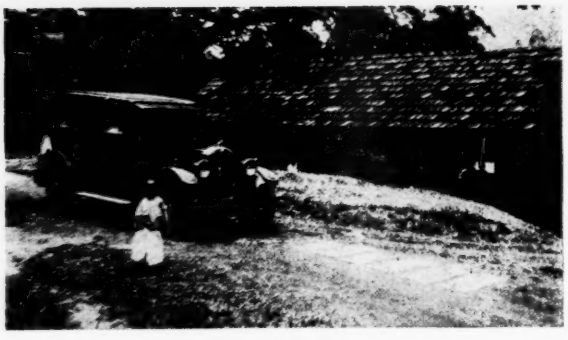


Fig. 8. How *not* to Dry Rubber; Producers Were Advised not to Drive Automobiles over It

Fig. 9. Wickham beside an Ancestral Tree Grown from One of the Seeds Brought by Him from Brazil

grade would hardly cure at all; in addition, it contained such accessory ingredients as sand, water, bark, leaves, ants, beetles, scorpions, knives, sticks, and stones, most of which ingredients are no longer familiar to our compounders.

However much we may be inclined to discredit the crude rubber of today, we do not have these troubles to contend with, and we can thank the plantation industry for such improvements.

Whom shall we credit with starting the plantations? According to popular belief (9), Sir Henry Wickham was sent from England to smuggle seeds out of Brazil. If he hadn't been successful, we might never have heard of his venture, but since the seeds did grow in London, and the plants did thrive in the Far East, and did evolve into plantations, there has been the inevitable criticism of Wickham and of the unrighteousness of his act.

As a matter of record, several shipments of seed had been sent previously by Wickham and by others, and, what's more, a few months after Wickham's successful shipment, more than 1,000 *Hevea* plants were sent by others to London (10). How could such a bulky and readily observed shipment be sneaked out of the country, even if seeds could have been?

Figure 9 is particularly interesting because it is a picture (11), not only of Wickham, but of one of the original trees grown from the famous seeds brought by Wickham from Brazil in 1876, carried as a seedling to Ceylon, and finally used as a seed-bearing tree. Hence it is one of the ancestral trees of the great plantations of today.

Some years ago I thought it would be interesting to see if the people of Brazil were as bitter as are some of our own armchair critics for having lost a monoply industry; so, in answer to an enquiry, I obtained a statement from the State Department of Industry and Commerce of Brazil. The letter is of great interest, and reads in part:

> *April 1, 1936*
>
> *I am mailing to you a copy of "Rubber, an Economic and Statistical Study". The author is Secretary of State of Brazil, and you may rely upon the authenticity of his research.*
>
> *You enquire as to the legality of the shipment of rubber seeds made in 1875. As there existed* no laws or regulations governing such exportations at that date, this shipment cannot be considered illegal.
>
> *Signed R. C. Oliveira,*
> *Commercial Representative of the Brazilian Government.*

I doubt that the same frank and fair-minded attitude was taken in 1875, for there are records of protests at that time against the obvious danger of Brazil losing its monoply industry. At any rate, why don't we stop sniping at Wickham and take a fairer attitude and a broader view of him, and of the India Office and Royal Botanical Gardens which sent him on his mission, and let them take their rightful places among the greatest contributors to our modern rubber industry.

Acceleration

Let us pass on to the third of what we are considering as outstanding developments—*Acceleration*. This is admittedly an involved subject, but a few facts seem to be irrefutable.

First of all, there is a striking difference between present-day accelerators and those of Goodyear and his century. Whereas Goodyear and his successors used metal oxides and carbonates, our important modern accelerators are all nitrogen compounds and, significantly, derivatives of ammonia. Does this mean that only derivatives of ammonia make good accelerators, and that

ammonia itself is inactive? Not at all, as witnessed by a patent of great historic and technical importance, issued way back in 1881 to Thomas Rowley of Manchester, England, for vulcanizing rubber in the prescence of ammonia (12). By this means, Rowley was able to reduce his sulfur to only 2% on the rubber and, of great significance and practical importance, to improve the aging of his vulcanized rubber by this reduction in sulfur.

This is indeed a highlight in technical progress and deserves much greater renown than has been accorded it. Interest nowadays seems to be in the advent of organic accelerators and the decrease in sulfur and better aging attendant upon their use. Yet as late as 1925, Bedford, in a famous court case, stated (13) that ammonia was still as powerful as any basic nitrogenous accelerator which he had tested, including diphenyl guanidine. After all, our organic accelerators are only derivatives of Rowley's ammonia in more convenient forms, and, of course, with greater accelerating power in many cases. It seems extraordinary that someone should have handed the rubber industry an accelerator with which sulfur could be reduced to a point regarded even today as fairly low, and with which aging could be improved, and that, in spite of this, for 35 long years nobody tried a more convenient form of gaseous ammonia—aniline—the liquid, or a still more convenient form—the solid, thiocarbanilide. We shall have to ascribe this to a complete disregard or ignorance of the literature, or to a complete lack of perception or imagination up to the time that Oenslager, Marks, and Spence started their memorable work (14).

Even when the use of thiocarbanilide had become widespread, and rubber chemists were intensifying their search for new and better accelerators, why did it take until about 1918, in other words ten years more, for someone to make the simple move of replacing the sulfur atom in thiocarbanilide by an NH group, and come forth with diphenyl guanidine as a better accelerator?

But Rowley isn't the only pioneer in this field who seems forgotten today. How many of us can, for instance, name the first to apply for a United States patent for an organic accelerator? Well, it happened to be Hoffmann and Gottlob (15) who in 1913 applied for a patent for accelerating the vulcanization of natural rubber by methylene bases, among them the accelerator now nicknamed "Pip-Pip," or No. 552 of du Pont. But the patent of Hoffmann and Gotlob makes no mention of the fact that these accelerators give better quality than do inorganic accelerators, and the patent seems to have had little influence on the granting of patents to others for organic accelerators.

On the other hand, a far more significant patent (16) is that of Boggs, of the Simplex Wire & Cable Co. As early as 1914 he applied for a patent on the use of *beta*-naphthylamine, *para*-phenylenediamine, and other amines as accelerators. Now this may seem only like just one more patent, but let us examine Boggs' patent more closely. Not only does he claim that his amines accelerate vulcanization, but—and this is of the greatest significance—that they improve the quality and aging of vulcanized rubber. These accelerators are parent substances of some of our best antioxidants of today, and Boggs' recognition before 1914 that such types of compounds improve the aging of rubber goods is of tremendous significance.

Only three years later, that is, in 1917, came another historic moment in the annals of accelerators, the discovery of the tremendous accelerating power of tetramethylthiuram disulfide, later to be marketed by others as Tuads, Tuex, Thiurad, etc., and now 33 years later, of greater, rather than less importance.

Figure 10 is a picture (17) of the "factory" where tetramethylthiuram disulfide was synthesized by a lone individual, who, like Goodyear, had no backing or even encouragement from anyone. A few miles from this "factory" this new accelerator was first mixed into rubber, and cures as short as one minute were obtained.

This is the "factory" of Stuart Benton Molony in Wellesley Hills, Mass., and his kitchen and basement were the chemical plant in which the now famous tetramethylthiuram disulfide was synthesized in 1917 and found to be an accelerator of great power (18).

Molony would study and plan his experiments in the evening, make his accelerators later in the night, and test them the next day in the nearby rubber factory. That the manufacturers of tetramethylthiuram disulfide and some of Molony's other accelerators was not entirely welcome in his neighborhood is evidenced by the fact that he was once the cause of an altercation between two neighbors. One of these who lived next to Molony had some hens, and when a neighbor next to him could stand it no longer, he finally burst out with,

"Ed, why do you feed your hens so damned much fish?"

Fig. 10. The "Factory" Where Tetramethylthiuram Disulfide Was First Manufactured in 1917

Fig. 11. The India Rubber Gutta-Percha & Telegraph Works, Silvertown, London, England, in 1910

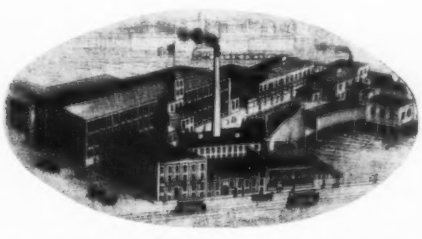


Fig. 12. Boston Woven Hose & Rubber Co., Cambridge Works, in the 1890's at the Time of the Pioneer Work on Alkali Reclaim

The owner of the hens vehemently disclaimed ever feeding his hens on fish, to which came the retort,

"Oh, yes you do, because a strong smell of dead fish comes in my bedroom window at night."

Whether Molony's nocturnal experiments were ultimately affected by this, I have no record. At the beach one summer Molony spread some accelerator on the rocks to dry, and people wondered why the sea gulls began crying, wheeling, and dipping with such unbounded enthusiasm.

Molony found, with his high-power accelerators, that rubber could be cured rapidly with much below 1% of sulfur; in other words, truly low-sulfur compounding was conceived right here. The surprising thing is that this versatile worker did not go one step further, take out the remaining bit of sulfur, and be the first to effect a no-sulfur cure, instead of Bruni and Romani (19) so soon afterward.

Let us, then, pay honor to the one who laid the foundations of modern high-speed curing and low-sulfur compounding.

Without wishing to make an anticlimax of this discovery of high-speed curing with organic accelerators, I should like to show an item in India RUBBER WORLD about really high-speed curing. In this report (20) we find the following data:

EXPERIMENTS IN VULCANIZATION

Fine Para Rubber	100
Sulfur	3
Litharge	50
Whiting	50

"Vulcanizations of samples of this compound were had in 211 days at 105°F average temperature. Vulcanization was perfect and the elasticity was good. With 5 and 7 per cent of sulfur, the elasticity was excellent. At a proper high temperature, somewhere under 600° F, there is no difficulty in vulcanizing a sample of the same compound, and the same thickness, in less than one second."

A. O. BOURN
Providence, Rhode Island
November 6, 1905.

In other words, someone in 1905 succeeded in curing rubber faster than the ten-second cure of the wire industry today. And if you try it, you will find that it works. So we begin to wonder what is new after all.

Reenforcement

Passing now to *Reenforcement*, let us turn to the laboratories of the India Rubber Gutta-Percha & Telegraph Works at Silvertown, near London, a picture (21) of which, taken about 1910, is shown in Figure 11. Here, just after the turn of the century, S. C. Mote and his coworkers discovered the extraordinary toughening action of carbon black in rubber, and from 1910 on the company not only marketed automobile tires containing carbon black, but developed the first successful cord-fabric construction to lengthen the life of the automobile tire still further.

According to records still available after the London air raids of 1941, a rubber mixture containing 30 parts of carbon black on the rubber was tested by Mote (22) as early as 1904. These carbon black stocks were tested for tensile properties, recovery, compression, hardness, natural and over aging, electrical properties, and oil resistance, and the results are recorded in graphs much the same as we use today. Stocks were tested in those days at Silvertown by scientific and accurate methods in an epoch when it was customary to judge quality chiefly by feeling, bending, and biting. The methods and technique then used anticipated strikingly our ways of testing and show attention to every detail, such as blending of rubbers, standard recipes, calender grain, design of dumbbell test-specimen, constant rate of stress instead of rate of extension, etc.

I have seen graphical data on tests of carbon black stocks, recorded in those early days at Silvertown, which show that the astonishing tensile strength of 4175 pounds per square inch was attained. This approaches the tensile strength of a natural rubber tire tread of today; so those who believe that tensile strengths over 4000 pounds per square inch can be obtained only with the help of our modern organic accelerators should examine these old records and see what was accomplished with carbon black alone. It is unfortunate that the strengthening effect of accelerators and of carbon black is not additive in our modern stocks.

The standing order or, let us say, permanent assignment at the Silvertown laboratory was "to try the effect of *everything* in rubber"; so, with the enthusiasm, perserverance, resourcefulness, and ingenuity of testing which we know its members to have had, it is not surprising that they were the first to discover the reenforcing power of carbon black and to apply it to automobile tires.

It did not take long for some of our American companies to catch on to the extraordinarily long wear of this Silvertown tire, and in a few years the carbon black era in rubber compounding was well on its way.

Reclaimed Rubber

The next item on our list is *Reclaimed Rubber*. This may seem like a quite unromantic subject; yet just think what reclaim means to present-day compounding.

When did people stop burning up worn-out rubber goods or throwing them on the dump, and when did usable and technically economical reclaim first appear? Some people may contend that the development of the acid process marks the advent of the first industrially satisfactory and economically valuable reclaim. But this process was applicable only to scrap rubber which was not tightly cured and which contained only very low percentages of free sulfur, and as the time came when the vast bulk of rubber goods was tightly cured and more difficult to reclaim, the acid process was no longer adaptable, and a new process had to be developed.

For the fulfillment of this need, let us turn first to a small rubber company in Cambridge, Mass., and from there to a rubber company in Akron. In the Cambridge factory, Marks and Price developed on an experimental and pioneering scale, in the 1890's, the now famous alkali process of reclaiming, and later at the Diamond Rubber Co., Marks carried the process to a successful conclusion, perfected it as a one-step process, showed that alkali removes cotton and free sulfur simultaneously, manufactured on an industrial scale the first generally usable and economical reclaim, and ultimately obtained the most famous patent in the history of reclaiming (23).

The factory where Marks and Price did their pioneer work is shown in Figure 12, which is reproduced from an actual contemporary letterhead of 1898. Incidentally, the department visible in the picture as standing over a canal was the tape department, and this department rejoiced in its fine reputation for the lowest waste of any department in the company. The reason for this became evident when the canal was ultimately drained and was found to be half-filled with tape which had been tossed out the windows.

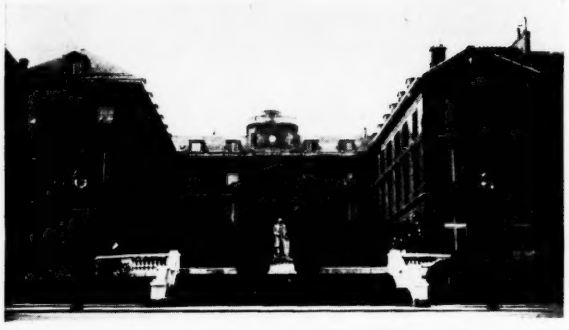


Fig. 13. College de France in Paris, Where Moureu and Dufraisse Carried out Their Historic Work on Antioxygenic Agents

The pioneer work of Marks and Price and the culmination of this work by Marks in Akron represent one of the important milestones on our progress because, by bettering processing, and for economy in the manufacture of a host of products, reclaimed rubber has won a well-deserved and indispensable place in rubber compounding. All rubber compounders cannot be wrong, as witnessed by the fact that the annual consumption of reclaimed rubber in this country alone is around 300,000 tons, or an amount of hydrocarbon in this form which is greater than the combined amount of Butyl rubber, neoprene, and nitrile rubbers.

Aging

Now let us turn to *Aging*, and its improvement by so-called antioxidants. First of all, how many know who coined the term "antioxidant"? Well, away back in 1905, Lumière and Seyewetz (24) in work on autoxidation, suggested the name *antioxidant* for organic compounds which retard such oxidation; for example, hydroquinone, which we know protects rubber for oxidation. These workers found out also the important fact that such agents do not retard oxidation permanently any more than our rubber antioxidants do.

But this early work, and other isolated cases, such as a patent in 1908 for retarding the hardening of crude rubber by basic aromatic compounds like dimethylaniline (25), is completely overshadowed by the work of two investigators already famous in the field of organic chemistry. Figure 13 is a photograph of the place where these pioneers carried out the first organized and comprehensive experiments on antioxygenic agents.

This does not look like a chemical company or a rubber company, and of course it is not, but is, instead, the renowned Collège de France in Paris (26), where, in the late 1910's, Moureu and Dufraisse carried on their famous investigations which, with their imagination and resourcefulness, led them into the fields of rubber, oils, soap, fuels, paint, food, and other of our important staples (27). Figure 14 is a rare photograph (26) of Moureu and Dufraisse taken at the height of their work.

These are the men whom we should credit with the discovery that certain types of organic compounds have, even in extremely low percentages, a remarkable protective action against the atmospheric aging of a host of important organic materials. They obtained convincing results under a wide variety of conditions and even formulated a theory to explain the antioxgenic action, and only those who have studied their work realize what a vast field they covered and how prolonged and systematic was their work. No subsequent developments in this field seem quite so startling as some of the work, such as the fact that the oxidation of benzaldehyde is retarded by only one-thousandth of 1% of certain compounds, or that about one-half of 1% of hydroquinone retards its oxidation 500,000 times. This makes our present antioxidants for rubber look ridiculous, for a simple calculation will show that if our chemical companies were to get busy and give us an equally powerful antioxidant, we could, by similar protection, make a stock which would age well for more than a million years.

However, even if we are a long way from this goal, antioxidants, such as they are, are used by every rubber manufacturer and, of course, have become almost indispensable. But don't let us forget that the background, and certainly the inspiration for their development, came from the pioneer and imaginative work of Moureu and Dufraisse more than 30 years ago, which has few equals in the field of applied organic chemistry.

Synthetic Elastomers

Next on the list of outstanding developments is *Synthetic Elastomers*. Well, I could surely make this a boresome subject if I were to spend much time on such a comparatively recent development.

In looking over what has been accomplished let us, first of all, distinguish between attempts to make something to use in place of crude rubber and attempts to make something different. GR-S, for example, was developed, not through the urge to create something better than rubber, but only in an effort to find a satisfactory substitute for crude rubber. On the other hand, neoprene, "Thiokol," nitrile rubbers, and Butyl are the culmination of attempts to make something better adapted to special services than is natural rubber.

A synthetic such as "Thiokol" has the added interest that it makes us realize that rubber-like materials can be made from unexpected raw materials, and that a useful elastomer may be utterly different in chemical composition from the long familiar hydrocarbon type of elastomer.

Historically, Bouchardat seems to have been the first to synthesize a hydrocarbon rubber, for away back in 1879 he started with isoprene, which he obtained by decomposing rubber itself (28), and, by reversing the process, he synthesized a rubber directly from isoprene (29).

Tilden in England (30), furthermore started with isoprene, this time not from rubber, but from turpentine, and in 1884 not only confirmed Bouchardat's observation

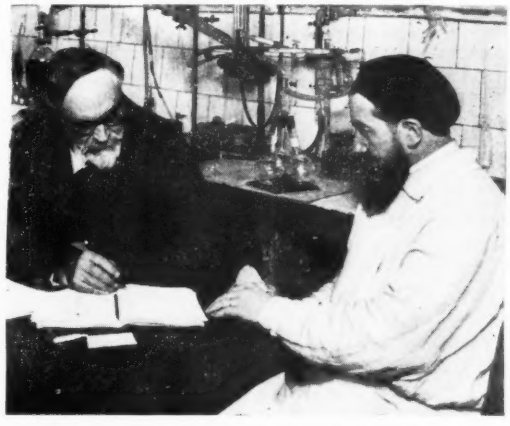


Fig. 14. Charles Moureu (*Left*) and Charles Dufraisse at the Time of Their Work on Antioxygenic Agents

that isoprene can be converted into a rubber by chemical means, but later in 1892 that, on storage, isoprene changes spontaneously into rubber that can be vulcanized with sulfur. Tilden also drew attention to the practicability of making synthetic rubber industrially.

This work of Bouchardat and Tilden, who are shown (31) in Figures 15 and 16 was truly historic, for it showed that rubber can be synthesized from chemicals in the laboratory, and it was a good omen that, some day, materials like natural rubber, or even superior to it, would be synthesized industrially.

But the work of Bouchardat and Tilden bore little fruit for many years, notwithstanding the desperate efforts of the Germans during the first World War; in fact, a few years before the war, we find an editorial in India RUBBER WORLD (32) which prophesies majestically as follows:

> "Not that it is claimed that synthetic rubber will never be attained. It may be. But its cost for years would make it only a plaything in the laboratory. Indeed, so far distant does the production of synthetic rubber seem that it is safe to say that, when it does appear, the cradles of the land will also be filled synthetically."

We surely did have to wait a long time, in fact, a hundred years from the time of Goodyear, for our synthetics, but at last we have seen success, both here and abroad: here, where the fundamental work on neoprene and Butyl was done; in Germany, where the fundamental work on butadiene-styrene copolymers (GR-S), nitrile rubber, and "cold rubber" was done. This youngest member of the family, "cold rubber," is probably only a forerunner of still better elastomers, and we should be only too glad to acclaim the ingenuity, acumen, resourcefulness, and imagination of the scientists, technologists, and engineers who have accomplished so much and who, we feel confident, will accomplish still more.

Cooperation

This brings us to the last subject of our discussion, *Cooperation*. Now some readers are likely to ask themselves why cooperation is included among the major technical developments of the rubber industry, and it might seem to bear little relation to the subject under discussion. But let us think over what a striking part cooperation, and by this I mean voluntary cooperation, has played in the progress of rubber technology.

We need only to recall the time when it was the custom and the duty, though I dare say not the pleasure, for technologists of the biggest companies in Akron to turn their heads the other way when passing on the street.

And this secrecy of years ago extended into even one's own company. I well recall that I was supposed to learn to compound without even being allowed to see the formulations of the stocks. When I had an idea of what I would like to do to some stock which was misbehaving in the factory, I approached the chief compounder. After diverting my attention to something out the window or perhaps to some feminine attraction, he pulled out of his pocket a little notebook and, with the pages open just enough to peek in, he decided whether my suggestion was feasible.

In Akron, operations in the factories were carefully guarded secrets, and when, on occasions, groups of laymen were taken on guided tours, the members of the groups were carefully screened before being allowed through the plants.

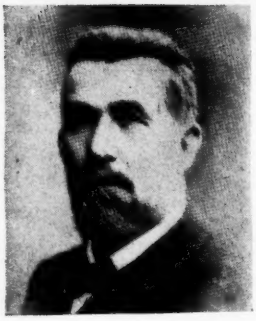


Fig. 15. G. Bouchardat

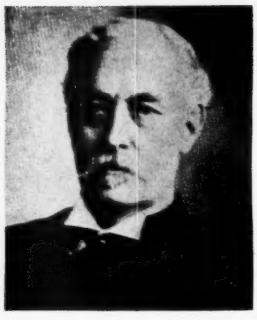


Fig. 16. W. A. Tilden

The story goes that, on one occasion, a member of one of these guided groups was dressed in ministerial garb, and at the point of the tour where the guests were allowed to see and feel sheets of rubber in process, the guide noticed that the supposed "minister" took a knife from his pocket, wet the blade with his tongue, and cut off a piece of rubber from the sheet. Wetting of the blade was, of course, a dead giveaway, and the "minister" was quickly ejected from the plant as an obvious spy from one of the competitive concerns in the area.

If every company were maintaining this attitude today, where would the rubber industry be, and would we be making products of the quality we actually are?

Away back in 1925 one of the most serious competitors of my own company in transmission belting was having trouble with its highest grade belt. The finished quality had fallen below normal, and our competitor was in a dilemma to find out whether the trouble was in faulty processing, compounding, or curing. This company was invited by our president to straighten out its troubles by visiting our factory and watching us compound and run the same type of belt. For three days several of our competitor's technical men stayed at our plant, saw everything, were given our compounds, were deprived of nothing, convinced themselves where their trouble lay, and returned to compete more effectively against us.

Look at the hundreds here today, exchanging new information formally as papers on the program, informally at lunch, in the corridors, and in the shadows of the amateur bars of the suppliers' suites. There are no rules to restrict the individual except his own conscience and judgment. Everyone is better off, and the companies are better off, by having learned something in return for what they have given.

Cooperation has done wonders for the advancement of our technical knowledge. It deserves a considerable share of the credit for the sensational advances which have been made in wartime and in peace. Finally, cooperation has been, as all of us know full well, responsible for the growth, prosperity, and prestige of our own Division of Rubber Chemistry.

Acknowledgments

The author is greatly indebted for suggestions, advice, and material aid to various of his colleagues, among whom he wishes to mention in particular M. E. Lerner and P. P. Pinto, of *Rubber Age*; P. Schidrowitz, H. J. Stern, and A. G. Brown, of London; Charles Dufraisse and Jean Le Bras, of Paris; S. B. Molony, of Conshohocken, J. T. Blake, of Simplex Wire & Cable Co., and Charles Wilson, of the Sun Oil Co., for their material help or advice, and J. M. Bierer and Boston Woven Hose

(*Continued on page* 449)

Fixtures Aid in Sharpening Dies Used To Cut Rubber Tensile Test Specimens

Rolla H. Taylor[1]

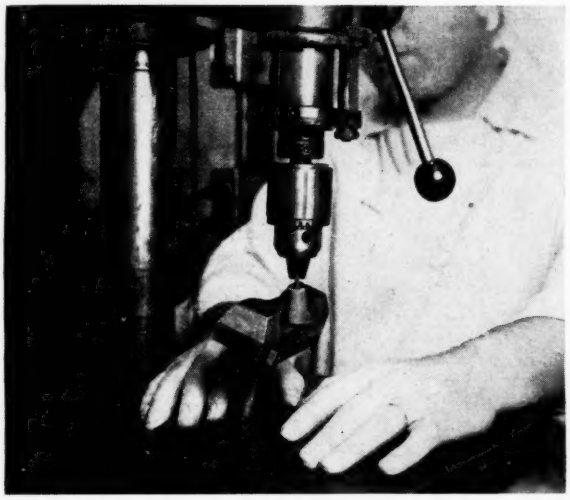


Fig. 1. Fixture Used in Grinding Outside Face of Die at an Angle of 20 Degrees with the Inside Face

FIXTURES designed to position dies so that the surface to be ground may be firmly held in either a horizontal or vertical plane have been found to aid materially in maintaining sharp dies. Schade[2] and Klute,[3] among others, have shown the importance of uniformly sharp dies when precise tensile properties are required. The difficulties experienced in maintaining uniformly sharp dies and in conditioning dies to meet the specifications given in ASTM Method D412-49T[4] led to the development of the fixtures discussed in this report.

Sharpening dies entirely by hand without mechanical assistance is not only tedious, but makes it virtually impossible for any but the expert to maintain the exactness of dimensions required for precise testing. With the aid of fixtures shown in Figures 1 and 2, however, this laboratory has been able to maintain without undue difficulty sharp dies conforming to the dimensions given in ASTM Method D412-49T.

Each fixture is composed of two parts. The base is made up by welding a piece of one-inch diameter cold rolled steel stem with a ½-inch reamed hole in the center to a ¼-inch flat cold rolled steel plate. The angle between the plate and the stem for the fixtures shown in Figures 1 and 2 is 70 to 30 degrees respectively. The part of the fixture which holds the die is made from a piece of channel iron with the flanges dressed down and with the inside squared up to take the die. A ½-inch shaft is mounted perpendicular to and in the center of the back of the channel. Both the die and the upper part of the fixture are held in place by set screws while work is being done on the dies. Obviously, the details of design are not important and are given only as a matter of completeness.

Fig. 2. Fixture Used in Grinding the Cutting Edge of the Die at an Angle of 30 Degrees with the Inside Face

In addition to the fixtures shown, use is made of a high-speed drill press, a small high-speed flexible shaft grinder, an illuminated magnifier, and an assortment of fine stones including hard Arkansas jewelers stones.

Complete conditioning is accomplished in the following order:

(1) The spacer block is removed, and the inside surface of the die is polished as specified in D412-49T. Particular care is taken to remove all tool marks.

(2) The edge of the die is passed over a piece of fine emery paper on a flat plate to assure the removal of all low spots in the cutting edge.

(3) With the die held as shown in Figure 1, the face touching the wheel is ground at an angle of 20 degrees with the inside face. The face of the die is passed back and forth across the grinding wheel until the flat edge on the cutting surface just begins to disappear. The last few cuts are made with a very fine stone and with a very light grinding pressure.

(4) With the die held as shown in Figure 2, the final

(*Continued on page* 449)

[1] United States Natural Rubber Research Station, Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, Department of Agriculture, Salinas, Calif.

[2] J. W. Schade and F. L. Roth, "Development and Improvement in Methods of Stress Strain Testing of Rubber" in Symposium of Rubber Testing, Special Technical Publication No. 74, p. 27. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

[3] C. H. Klute, "The Effect of Die Surface Irregularities upon Results of the Tensile Test for Vulcanized Rubber," India Rubber World, 120, 455 (1949).

[4] Tension Testing of Vulcanized Rubber (D412-49T). "A.S.T.M. Standards of Rubber Products," p. 887. Published by American Society for Testing Materials, April, 1950.

Advances in the Uses of Rubber in Engineering, 1949-50[1]

Leora E. Straka[2]

THIS survey covers the literature from July, 1949, to July 1950. No attempt has been made to include developments of a purely chemical or theoretical nature. The subject matter of this paper is devoted to advancements which are of interest to mechanical engineers. EDITOR.

ANY discussion of recent advances in the field of rubber must necessarily be preambled by a survey of the international and economic rubber situation during the period of the literature review and beyond, if possible. The remarkable development of synthetic rubber during World War II years has advanced to such a stage that in many fields synthetic rubber has progressed from competitor to the successor of natural rubber. Obviously this situation creates a problem for the natural rubber producers, and considerable concern is being evidenced (1).[3]

The rubber situation today is acute. The sources of 90% of our natural rubber supply is in jeopardy because of the political instability of Indonesia and the threats of Communism in Malaya and Indo-China (2). In June, 1949, the price of GR-S was 18½¢ a pound; in June, 1950, the price was the same. On December 7, 1950, the price was advanced to 24½¢ a pound. In June, 1949, however, the price of natural rubber was 16¢ a pound; while one year later it was 35¢ a pound, and since then it has risen to as high as 90¢ a pound.

Statistics show that the various synthetic rubbers have declined sharply from their wartime peaks (3). GR-S supplied 59% of the total synthetic consumption in its peak year, 1944, but only 29.2% in 1949. According to rough calculations (4), if there are produced 1,550,000 tons of natural rubber, 900,000 tons of which are to be used by foreign countries, 650,000 tons remain for the United States. If 100,000 tons are deducted for stockpile use, 550,000 tons are left to supply requirements of about 1,025,000 tons, or a deficit of 475,000 tons. About 108,000 tons of this are used in the form of Butyl, neoprene, and nitrile types. Thus 367,000 tons of GR-S are left to keep up rubber goods production under relatively normal conditions.

Until June 30, 1950, the government's synthetic rubber activities were conducted under the Rubber Act of 1948. This legislation provided that capacity for production of synthetic rubber should be maintained and required that minimum quantities be produced and consumed each year. In his legislative recommendations to Congress (5). President Truman requested ten-year controls of the synthetic rubber industry along with a method of disposing of the government owned plants to private industry over this period. On June 24 the President signed the Senate-House compromise bill which continues government ownership and operation for a two-year period.

Although opposition was originally expressed (6) by some leaders in the rubber industry, the facts remain that since the United States has no control over the supplies of natural rubber, it is necessary to create a source which is dependable and will insure security. This has been done by government regulation, and steps have been taken to increase the annual output of synthetic rubber and to build up a larger stockpile (2).

One step toward government decontrol this year has been the conclusion of the patent pooling on synthetic rubber (7).

In July, 1950, a decision was made by the government to reactivate one of the GR-S plants, one of the Butyl rubber units, and a butadiene plant (8). Recent authorization has subsequently been granted for the reactivation of all of the copolymer units as a part of the government program. In October the government took another step toward building up the national stockpile. This comprises a general limitation on the use of natural rubber (9). The new regulations issued by the National Production Authority limit consumption to 75% in November and 63% in December of the average monthly use for the 12-month period preceding June 30. The new regulations also restrict the use of natural rubber latex for the fourth quarter to one quarter of the 1949-50 fiscal year and require importers of latex to offer at least 10% of their shipments to the government. All synthetic available is first used each month and the difference filled in with natural rubber. Although no formal announcement has yet been made, there are indications that in the near future the government will take over the buying of all natural rubber used in this country.

"Cold Rubber"

Within the past year "cold rubber" had advanced from the batch process to the continuous polymerization process (10). The greatest difficulty of this conversion was trying to keep air out of the system. The most important advantageous features of continuous polymerization are (a) simpler equipment and greater ease of temperature control, (b) smaller variations in the conversion levels and viscosity of the polymers, and (c) continuous blending of the ingredients gives a more uniform latex and a product of higher more uniform quality.

Infrared investigations have shown that the molecules of "cold rubber" have a *trans* chain structure, while those of GR-S have a mixture of *cis* and *trans* (11). Since natural rubber consists of a *cis* structure, "cold rubber" resembles natural rubber more closely only because of an improved regularity of structure.

Improvements are constantly being made in the poly-

[1] Presented before Rubber & Plastics Division, ASME, New York, N. Y., Nov. 30, 1950. (Contribution #177 from the Goodyear Tire and Rubber Co., research laboratory), Akron, O.
[2] Goodyear Research librarian.
[3] Numbers in parentheses refer to Bibliography items at end of this article.

merization formula (12) and compounding and processing variables (13). Claims have been made (14) that the tread wear of tires made from "cold rubber" black masterbatches is better than that of tires in which furnace black was mixed in the Banbury. Since the reinforcement of "cold rubber" with fine furnace blacks represents an important new advancement (15) toward the improvement of tread performance, the concept of the carbon black gel complex has been introduced (16) as an explanation of the significant differences between the various types. Improved processing and performance of natural rubber has also been attributed to the carbon black gel (17). The use of a fine particle silica in regular or "cold rubber" shows definite superiority to the calcium silicate pigment and even surpassed black compounds with respect to elongation, rebound, and heat build-up (18). Comparative data (19) have been assembled which show the similarity in the physical and chemical properties and also in the compounding data of American "cold rubber," the German Buna S-3, and Polysar S. In addition to its use in tires a description has been given of a flexible cable made with "cold rubber" insulation and neoprene jacketing (20).

While standard "cold rubber" is polymerized at 41° F., emulsion can be effected at temperatures as low as —40° F. (21). Although data on tire tests are still too scant to draw definite conclusions, there is some evidence of improvement in tread wear and more positive evidence of improved tread crack growth, but no indication of a revolutionary trend.

In summarizing the "cold rubber" situation it should be emphasized (22) that "cold rubber," like regular GR-S, requires carbon black loading to have sufficient toughness even for carcass stocks. Even though it is more resilient than the old GR-S, this improvement is not sufficient to overcome the handicap caused by the use of black, especially for larger tires. The greatest benefit from the use of "cold rubber" is in tire treads and, when used with the recently developed HAF blacks, "cold rubber" tread wear is somewhat better than that with natural rubber.

New Types of Rubber

Vulcollan is a recently introduced highly elastic material (23) prepared by reacting linear polyesters with a "bulky" diisocyanate. These materials have good tensile and aging properties, and suggested fields of applications are for protective coatings.

Research is being continued on the polymerization and processing of polymers of butadiene, butadiene-styrene, and isoprene by means of Alfin catalysts, which are special combinations of sodium salts (24). Improvements are being made to obviate the difficulties originally encountered in the milling and compounding procedures, and the resulting vulcanizates show better tensile and abrasion properties than the corresponding emulsion polymers. A product which shows promise for use in tire carcasses is obtained by the copolymerization of butadiene and styrene with sodium as the catalyst (25); however, further tests are needed before actual claims can be established.

Polymers with greater cut-growth resistance are obtained by the use of the Buna S-3 recipe, which is a modification of the GR-S formula (26). Clear polymers which show indications of being used as replacements for natural rubber in chemical reactions such as chlorination, cyclization, and hydrochlorination are obtained by the solvent polymerization of isoprene and styrene-isoprene (27). The polyacrylic rubbers are recommended as specialty rubbers where the service conditions are too severe for the conventional products, such as for O-rings, gaskets, grommets, hose, actuating diaphragms, valve seats, packings, etc. (28). Neoprene Type W is a newly developed chloroprene polymer which is more stable than other neoprene products and is characterized by greater resistance to compression set (29). Depolymerized rubber which has been under continuous development for a number of years is now commercially available as DPR, a thick, flowable, all-rubber liquid (30). Depolymerized rubber compounds can be spread, troweled, or cast into molds and vulcanized in hot air at atmospheric pressures. New types of polyurethanes made from castor oil and diisocyanate furnish products which vary from extremely hard to soft rubbery materials. These exhibit good electrical and physical properties and provide good shock dampeners (31).

A rather interesting observation has been made whereby the rate of the emulsion polymerization of GR-S has been doubled by irradiation with ultrasonic energy (32). The exact role of the ultrasonic agitation in accelerating these reactions is not understood.

Compounding

Physical test data of the rubber reinforcing properties of high abrasion furnace blacks record the improved reinforcement possible with this black in both GR-S and natural rubber (33). The general effects of high temperature mixing of fully reinforcing carbon blacks in synthetic and natural rubbers are evidenced by lower power rate of extrusion, less nerve, higher modulus, lower tensile, higher rebound, and a lower resistance to abrasion (34). The tendency for rubber mixtures containing reinforcing furnace black to scorch can be minimized by using a thiazoyl disulfide for acceleration and a nitrosodiphenylamine as retarding agent (35). In a study of the effect of various carbon blacks on the heat transfer characteristics of vulcanizates the results show that the blacks differ markedly in their effects (36). The differences in the electrical properties of various carbon blacks in natural, GR-S, cold, and Butyl rubbers is attributed to the degree of dispersion of the carbon black inherent in the particular polymer (37).

Homogeneous blends of neoprene, natural rubber, and acrylonitrile furnish heat resistant compositions suitable for tire molding bags, conveyer belts, and gaskets (38). Oil resisting natural rubbers have been obtained by the addition of aliphatic chlorothiol acids (39). Dense rubbery compositions are produced by the incorporation of fusible metallic substances, as dense fillers, in a fused condition into natural or synthetic rubbers (40). A study of directional effects in dielectric properties of molded rubber shows that flow during molding produces a structure in which the dielectric constant and dissipation are greater in the direction of flow than in other directions (41). This fact offers the possibility that an extrusion head could be designed to take advantage of this effect in cable manufacture.

Low Temperature Evaluation

Within the past year emphasis has been placed on low temperature evaluation of natural and synthetic rubbers as a result of the extreme importance placed by the Armed Services on the adequate performance of rubber after exposure to low temperatures (42). Compounding variables which affect the low temperature behavior include the type and amount of plasticizer, particle size of the carbon black, and extent of vulcanization (43). The

low temperature flexibility of GR-S can be improved by increasing the amounts of plasticizer and carbon black without too great a deterioration of physical properties; tensile strength appears to increase slightly. Progressive stiffening due to crystallization has been observed for vulcanizates of *Hevea,* Neoprene Type GN, Butyl rubber, and a butadiene-styrene copolymer (44). A general conclusion was drawn from this investigation that the greater the amount of combined sulfur the less the crystallizing tendency. Data seem to show a dependence of crystallization on carbon black loading, but actually any effect of the carbon black was dominated by the variations in combined sulfur which occurred.

Another investigator has shown (45) that the hardness of vulcanized rubber mixtures increases relatively little down to about —40°; below this it increases rapidly and is complete at —65 to —70°. The higher the sulfur content the less was the increase in hardness from 20° to about —40°, and the more rapid the increase from this to —65°. Impact resilience also shows a minimum value at a temperature which is connected with the brittle point (46).

Testing and Analysis

Experimental results on the effects of oxygen and temperature on the aging of GR-S vulcanizates have indicated (47) that oxidation, in addition to promoting loss of strength, is one of the chief causes of the stiffening during aging. Oxidation, however, can also cause softening, presumably by chain scission, and at high temperatures an increase of oxygen concentration favors the softening reaction. With respect to analytical procedures it has been claimed (48) that routine volumetric measurement of rates of oxygen absorption of vulcanizates can give comparisons which for control purposes are as adequate as those provided by standard procedures. Since unprotected tires stored or displayed in the open will become cracked owing to atmospheric ozone, tests show (49) that paper wrapping affords adequate protection. The superiority of neoprene vulcanizates for services involving outdoor exposure has already been demonstrated, but data show (50) compounding ingredients do exert a definite effect. Of a variety of loading materials studied only carbon blacks and clays were found to improve weather resistance over that of the gum stock; whiting is noticeably deleterious.

In the case of a number of synthetic rubbers, compounding with carbon black influences the deleterious effect of temperature on tensile strength, but this action is accomplished merely by shifting the optimum strength values to a higher temperature (51).

A machine has recently been developed for surveying the speed dependence of tensile strength; it is capable of recording the stress-strain curve of rubber at rates of elongation up to 9,000 times that used in the Scott tensile test (52). In measuring the dynamic properties, investigations show that semi-reinforcing furnace blacks or lamp blacks are preferable because the modulus of these stocks are less sensitive to amplitude and imposed static strains (53). Frequency oscillations between 0.5 kc/s have been recommended as a suitable method for measuring the dynamic elasticity of rubber compounds (54). The reported large differences between the static modulus and the dynamic modulus measured at very low frequencies is explained by the fact that these differences are due to elastic after-effects of previous deformations (55). A comparison of the electrical compression vibrator and the Roelig-type apparatus for dynamic stiffness and hysteresis shows that the lower stiffness and higher hysteresis obtained on the Roelig test is attributed to the greater energy input per cycle (56). A modified Yerzley oscillograph has also been recommended for evaluating the elasticity and viscosity coefficients and related damping properties (57).

Several new types of apparatus have been designed for measuring stress relaxation under compression (58).

The permeability of butadiene copolymers to a given gas can be strongly reduced by the presence of acrylonitrile (59). A general rule is that the presence of polar groups produces low permeability. In a study of the light stiffening of GR-S proofing data show that wave lengths longer than about 540 millimicrons have only an insignificant effect (60). Indices for the flex life and heat build-up properties of elastomers show that these properties are independent of the state of cure, but dependent upon the test recipe and the dispersion of the compounding ingredients (61). The use of Freon fluorinated hydrocarbon refrigerants has presented some problems in connection with the use of elastomers as gasketing materials (62). A variety of elastomers, however, is available, and the manner in which they are affected differs greatly, depending on both the elastomer and the halohydrocarbon.

With respect to the aging of rubber, the deleterious action of copper may be neutralized by tetramethylthiuram disulfide; whereas fat acids increase it (63). The rapid determination of small amounts of zinc in vulcanized rubber is possible by polarographic techniques (64).

Adhesion

A newly introduced rubber-to-metal adhesive, Kalabond RM-2, is unique in that it provides a direct chemical bridge between the rubber and the metal (65). Another process involves the use of a chlorinated rubber solution and a special latex (66). Airless blasting has been recommended for the preparation of the metallic surface in rubber-to-metal adhesions (67). Calcined MgO improves the adherence of insulating compounds to metals (68), while silica aerogel is used for brass plated steel (69). A method has been described for measuring maximum stress at break along with an empirical method for estimating the blow on the bond as distinct from that exerted on the unit (70). The preferred method of bonding rubbers to metals and ceramics by means of polyisocyanates involves the use of a mixture of chlorinated rubber and compounded neoprene in the adhesive (71).

The continuing investigation of the adhesion of rubber to fabric has disclosed a number of materials which improve the bond. These include an alkali soluble resinous condensate (72), the reaction product of HCHO and a polyhydric phenol (73), an alkali metal or NH_4 salt of polyacrylic or polymethacrylic acid (74), maleic anhydride in pyridine (75), a mercapto or sulfhydryl compound (76), carbonates and acetates of zinc, cadmium, mercury or nickel (77), and casein (78). The direct adhesion of rubber to continuous filament differs widely from rubber to rubber, but these differences largely disappear with the increased adhesion observed when staple fiber is incorporated in the fabric (79). The importance of the control of film thickness has also been demonstrated (80). A number of factors must be taken into consideration in the empirical evaluation of rubber-fabric bonding agents (81).

Sponge Rubbers and Latex

Within the past year perhaps the most outstanding advancement in the field of frothed latex sponge has been

the production of a more uniform structure as a result of improvements in continuous frothing units (82). Other advancements include smaller bubble size by controlled beater speed (83) along with improvements in processing methods and compounding techniques (84). Snap may be improved by the incorporation of paraffin hydrocarbons (85). The incorporation of glass fibers serves as an extender and reinforcing agent and causes articles to shrink less in the mold (86). The shrinkage of foamed neoprene latex prior to curing is reduced by the use of aldehyde-amine reaction products and by maturing (87). The setting of the froth may be accomplished by a low-frequency alternating electric current (88) or by steam (89), and distortion during molding may be minimized by the use of a mold adhesive (90). Since the effects of copper on foamed sponge are rapid hardening and loss of resilience, it is important to include a copper inhibitor in the formulation (91). A good general evaluation of the quality of a foamed latex vulcanizate may be obtained by performing three types of measurements: tensile strength, compression modulus, and fatigue resistance (92).

Expanded cellular rubbers have been obtained by the use of dinitrosoamino compounds (93), a combination of sodium bicarbonate-fatty acid (94), gas under pressure (95), and water soluble granules (96). Cellular products have also been prepared from isoolefin-diolefin low-temperature copolymers with the incorporation of a blooming agent (97). The compression properties of cellular ebonites from nitrile-type synthetic rubbers are affected by several compounding variables such as amounts of sulfur, diazoaminobenzene, plasticizers, pigments, and accelerators (98).

A flow casting process for latex has been developed (99) whereby suitably compounded latex containing curing agents is poured into a plaster mold. A rubber skin forms on the plaster wall, and water and the nonrubbers in solution are absorbed by the plaster. After the excess latex has been poured off, the unit is dried and cured.

Rubber Pavement

The use of rubber in road construction is continuing to stimulate further investigations of technologists and engineers (100). The results of tests to date indicate (101) that rubber added to asphaltic paving material increases the life of the pavement, requires less maintenance, increases the elasticity of the pavement, reduces its susceptibility to temperature variations, materially increases the coefficient of friction of the surface area, and the pavement is less brittle at low temperatures. Within the past year additional experimental roads have been laid in New York City (102), Singapore (103), London (104) and Canada, Texas, and Minnesota (101). Rubber surfaces have also been extended to playground surfaces (105), tennis courts (106), and airport constructions (107).

It is claimed that the use of a special synthetic rubber gave excellent results because, when mixed with asphalt, it gave a wider useful temperature range than either new or reprocessed natural rubber (22, 108). With this special synthetic, tests show up to 50% decrease in penetration with 5% rubber powder. The softening point has shown a 35% increase. Impact, as measured by height of drop for fracture at 35° F., shows that the drop height is tripled with the use of 5% of this special rubber (109).

A composition which has been used as protective sealing coats on asphaltic surfaces such as roadways, floors, etc., consists of a mixture of asphalt and a copolymer of methacrylonitrile and butadiene (110). The technique used in the preparation of latex-cement floors has been improved by mixing the latex plus stabilizer, in a highly concentrated form, directly with the dry cement (111).

Coating Compositions

Latex and rubber emulsion paints are now available as paints of highly acceptable quality (112). The inherent advantages of emulsion paint systems are freedom from toxic solvents, good washability, short drying time, good application characteristics, and good shelf aging properties. With these new paints the vehicle, a butadiene-styrene copolymer, is supplied in preemulsified form and requires only the addition of pigment dispersions and solutions of protective colloids, sequestering agents, fungicides, etc. Paints of this type have been formulated in both flat and semi-gloss finishes and are not limited to interior applications. Preliminary results from exterior exposure tests indicate that the behavior of pigments in these emulsion paints is similar to their behavior in oil paint systems.

Investigations on coated fabrics which would be able to transmit body perspiration and to avoid heat build-up on the inside of the impermeable garment have led to the development of a water impermeable-water vapor permeable fabric (113). This has been accomplished by means of a composition comprising a solid pigment with a rubber cement which functions by means of a complicated three-dimensional interconnected structure of micropores.

Rubber Derivatives

Rubber-like derivatives with a chlorine content of 1-17% and possessing good oil and flame resistance have been prepared by the direct chlorination of crepe rubber in carbon tetrachloride (114). These products retain, to a greater or lesser degree, rubber-like properties and are capable of hot or cold vulcanization with or without the addition of vulcanizing agents. Chlorinated butadiene polymers with chlorine contents up to about 70% yield products capable of forming solutions of suitable viscosities and are soluble in a wide range of solvents (115).

Silicone Rubbers

Silicone rubbers were initially developed to satisfy the requirements for high temperature usage, but recent investigations have proved the outstanding potentialities of these products for use at extremely low temperatures (116). Actual tests results show that most of the silicone rubbers passed through a first-order transition at temperatures ranging from —65 to —74° C., with consequent stiffening owing to crystallization; however, one variety exhibited no first-order transition and should have good possibilities for use at temperatures as low as —100° C.

Reclaim

A critical survey of the evolution of different types of reclaimed rubber has led to the conclusion that the property which gives the best indication of the value of a reclaimed rubber is its aging in air at 100° (117). Of the chemical compounds contained in coal-tar naphtha solvent certain chemical configurations were found to be highly effective as reclaiming agents; while others were inert (118). Hydrogen sulfide vapor has been recommended for reclaiming Butyl rubber (119); while various amides, nitriles, and amines (120) are used in reclaiming other elastomers.

Ebonites containing reclaimed rubber as a replacement in natural rubber or GR-S mixes show definite differences in properties (121). In contrast to its behavior in natural rubber ebonites, the reclaim in the GR-S mix has not reduced the unnotched impact strength, cross-breaking strength, or elongation, so that the GR-S/reclaim ebonite is at least equal to the natural rubber/reclaim ebonite, whereas in the absence of reclaim, GR-S is inferior to natural rubber.

Apparatus and Machinery

A new machine for curing tires, the Bag-O-Matic, with one sequence of operation, bags, cures, and debags (122). Not only does the Bag-O-Matic combine these operations, but it does them in approximately one-half the time normally required on the three units. High-frequency dielectric heating is recommended for homogeneous rubber stocks and for large masses of homogeneous material, but investigation shows (123) that many stocks, particularly carbon black stocks, do not possess uniform electrical properties. Controlling heat losses is an important factor in molding operations because the temperature drop of a mold during the loading and unloading portion of the curing cycle and the time required for the mold to return to platen temperature are sources of variation in the physical properties of the vulcanizates (124).

In the use of the Banbury rubber mixing machine it is claimed that one of the most important principles is to arrange conditions so that the stock is quite stiff during the period that pigments are being dispersed in the rubber (125). In the design of an extruder for rubber and plastics it has been pointed out (126) that no extruder should be considered as a universal machine because a number of conditions are involved which affect the extruder performance. With respect to molding techniques a resinous styrene interpolymer coating for metallic forms (127) and a spacer or mold surface (128) for the vulcanization of rubber have been introduced.

A non-contacting thickness gage employing beta ray emitting isotopes has been developed (129) which makes possible weight per unit area or thickness measurements on materials which are accessible from only one face or on materials which are superimposed on other substances provided that an atomic number difference exists between the two materials. Measurements can be made on rubber or plastic compounds, or the total weight per area of rubber coated fabrics, while the material is still in contact with the final calendering roll.

Rubber-Plastic Blends

High styrene resins, which have already acquired recognition because of their reinforcing efficiency, are expanding their usage in rubber compounding by improvements in processibility (130). Reinforcement of various physical properties of rubber has also been obtained by the addition to the latex of various synthetic resins, such as resorcinol-formaldehyde, at different stages of condensation (131). Another type of plastic-rubber blend, whose properties indicate that it is probably a phenolic thermosetting plastic with Buna N, can be produced in varying degrees of flexibility ranging between elastic soft rubber and brittle hard rubber (132).

Other Applications of Rubber

The durability, waterproofness, and abrasion resistance of leather can be increased by impregnation with a solution of natural or synthetic rubbers (133) and then vulcanizing with an accelerator of the dithiocarbamate type. Rubberized coatings can now be applied to all the underneath parts of the car body, and the noise from flying stones can be effectively deadened (134). The inside of the hood can also be treated with this rubberized coating so that engine noises are muffled and vibration is lessened.

Since rubber bearings have been widely used in marine service, tests have been developed for the measurement of their coefficient of friction and wear (135). By the suitable selection of elastomers and compounding ingredients, materials for bearings with lower coefficient of friction and longer life have been developed. Rubber crimping is shown to be applicable to the assembly of thin-walled metal tubes or other parts, especially in products using fluid actuation (136); this process enables tighter joints with low residual stress. Modifications have been made in the tread design and composition of tires for the purpose of improving traction and wear (137).

A fabric for tires, belts, etc., which does not stretch unduly at room temperature comprises a material which consists of a weft yarn of polyethylene, halogenated, oxidized or cyclized derivatives of rubber, cellulose ethers, or lightly cured rubber thread (138). A wire fabric tire casing has been designed which may be operated at substantially the same inflation pressures as tire casings of like rating using conventional textile fabric (139).

With respect to rubber spring units, a study has been made of the static and dynamic properties of various natural and synthetic rubbers whereby certain general relations were found (140). A nomograph has been constructed, and a technique developed for the application of these ratios.

A study of the gasketing problem on liquid-filled electrical apparatus has led to the conclusion that nitrile rubber is the most promising type of compound for such gasket applications (141). For improving the covering of wire with plastic or rubber an automatic extruder control has been developed which makes it possible to control the speed of the wire through the extruder and produce wire to close tolerances (142). Evidence has been presented that some of the failures of non-leaded rubber insulated underground cables have been caused by living microorganisms (143). Natural rubber compounds were the most susceptible, while in some soils GR-S compounds proved stable up to two years, but failed in a more active soil. The observations, that if a sample of conductive rubber-carbon black mix is placed between two metal electrodes at different potentials, the intensity of the current across the sample varies considerably as a function of the pressure applied by the electrodes to the surface of the sample, has been extended to applications requiring a modulation of electrical current by mechanical vibrations as in the electro-acoustic field (144).

Latex films, to which corrosion inhibiting materials such as sodium benzoate and sodium nitrite have been added, have been used to protect steel parts during transportation and storage (145). In a study of the use of polyethylene in contact with rubber in applications which involve rubber grommets as a part of an assembly where polyethylene film is used for a moisture impermeable cover and in electrical applications where rubber components and polyethylene are used jointly, conclusions are drawn that GR-S compositions are unlikely to have any adverse effects, but compositions based on more oil-resistant rubbers may produce deterioration of the polyethylene (146).

Rubber Metabolism

Although extensive research has been conducted in the field of rubber for many years, the mechanism of rubber metabolism is still an unsolved problem. Since isoprene has never been found in plant tissues, investigators have attempted to discover the particular organic substances that serve as precursors of the isoprene unit. One investigator has based his work on the view that pyruvic acid and acetone undergo condensation to furnish a C_6 hydroxy "acetone pyruvic acid," which leads to an unsaturated C_5 alcohol or a saturated C_5 glycol that plays a significant role in isoprenoid syntheses. Another investigator (148) believes that the reaction of acetone and acetic acid to give betamethylcrotonic acid is involved in rubber formation. A theory has also been proposed that the synthesis of rubber probably takes place mainly in the green parts of the plant and principally directly from carbon dioxide which is reduced to isoprene among other products (149). According to this theory freshly synthesized rubber is present in the plant in the liquid state!

If the problem of the mechanism of rubber metabolism can be solved, and if these conditions can be duplicated in the laboratory, this work will represent a definite long step toward the solution of plantation rubber problems.

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Some Real Pioneers

(Continued from page 440)

& Rubber Co. for their generosity in time and expense. Finally C. S. Frary, Jr., an associate of the author, deserves commendation for his spontaneous interest in helping prepare the illustrations and modify the text.

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(2) From the same publication as Fig. 1.
(3) From "Legends of Woburn, 1692-1892," by Parker Lindall Converse, Andrews, Cutler & Co., Woburn (1892).
(4) The author is indebted to Charles Wilson, of Sun Oil Co., for this photograph, taken in 1950. The kitchen in which Goodyear is reputed to have discovered vulcanization has been remodeled. A photograph of it is in the possession of the author.
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Sharpening Dies

(Continued from page 441)

sharpening is done by hand. A stone held horizontally will cut a face at 30 degrees with the inside face.

(5) Upon completion of the sharpening, the spacer block is replaced, and the die tested for correct width. Deviations in width from specification requirements are corrected by adjusting the spacer block as necessary.

The above method has proved to be satisfactory for maintaining uniformly sharp dies in this laboratory and is recommended for general usage. Obviously, the number of steps required for a given die will depend upon the condition of the die.

The German Plastics Industry

THE state of the plastics industry in the Federal Republic was discussed at a recent plastics meeting in Munich. In 1936 the industry produced 20,000 tons of plastics, but war demands raised the amount to about 200,000 tons by 1943. Early postwar production again fell to a very low level, but improved facilities for obtaining necessary raw materials and revived interest have stimulated the industry so that output is again rising and in 1949 came to roughly 70,000 tons. This figure is about 11% of American output. The figures for 1950 are expected to show a further increase to 15-16% of United States production, and an annual output of 100,000 tons by 1952 is hoped for. Quality is said to be up to prewar standards, and an export trade is developing satisfactorily.

In the first half of 1950 the Federal Republic produced 14,355 tons of polymerization plastics and 24,363 tons of condensation plastics, which figures compare with 11,133 and 22,704 tons, respectively, in the corresponding half of 1949.

Numerous large and smaller firms are engaged in converting plastics to a wide range of articles for household and technical use, besides toys and sporting goods. Probably half the factories are in the North Rhine-Westphalia area, and more than half the total volume of output stems from this sector.

To insure adequate trained personnel for the growing industry it was decided on October 28 to create the first German Plastics Institute at the Technological Institute of Aachen. The program for the time being includes short courses for manual workers to familiarize them with the most efficient methods of working the various plastics and the operations involved in the manufacture of different articles; and short courses for sales people; in addition there will be full courses for aspiring plastics technologists. Eventually it is hoped also to be able to do an increasing amount of research work.

On October 18 it was decided at a meeting in Munich to dissolve the loose, working combination of local associations of firms engaged in working plastics and to form instead a General Association of the Plastics Manufacturing Industry. President is R. Rohm; headquarters are to be in Frankfurt a.M.

EDITORIALS

The Outlook for 1951 – Probably Difficult!

THE rubber industry, which has just completed a record breaking year of production of rubber goods and consumption of raw materials, is looking toward another big year in 1951. Developments in connection with the worsening world situation during the latter half of 1950, which necessitated the declaration of a state of national emergency by President Truman in December, will cause major changes, however, in the pattern of the industry's efforts in the New Year.

Harry E. Humphreys, Jr., president, United States Rubber Co., in his year-end statement pointed out that in the event of a general war, the rubber industry can convert more quickly than most industries to all-out defense production because the Armed Forces use many of the same rubber products that civilians use.

John L. Collyer, president, The B. F. Goodrich Co., took the position in his year-end statement that 1951 rubber consumption might range anywhere from 1,000,000 to 1,200,000 tons, slightly lower than in 1950, despite higher military requirements.

P. W. Litchfield, chairman of the board, Goodyear Tire & Rubber Co., said that indications are that 1951 will find output of the rubber industry limited only by the available supplies of base materials. There will be a change from civilian to military production that will require a certain amount of civilian sacrifice, but we should all face this prospect with courage and determination. There can be no such inertia and uncertainty in 1951 as there was in 1950 if we are to survive as a free people, Mr. Litchfield added, however.

J. P. Seiberling, president, Seiberling Rubber Co., concurred with the statements of other industry executives and said also that whether or not total war comes in 1951, he believes that the rubber industry will operate at full capacity during the year.

A. L. Freedlander, president, Dayton Rubber Co., seemed to think that the gap between civilian demand and military demand would be filled rather quickly and that the rubber goods plants could be kept running at reasonable capacity if supplies of raw materials and component parts were available.

India RUBBER WORLD takes the position that any new defense or war preparation effort means a return to government controls on a major scale, but since the rubber industry was never completely decontrolled after World War II, the return to wartime controls should not represent too much of a change.

If we are to have a major defense effort, however, the national rubber program needs even greater coordination than has been ordered recently. Rubber products in addition to needing natural, synthetic, and reclaimed rubber, require an adequate supply of numerous other chemicals and textiles, many of which are in as great demand by other industries, and top level expediting will be necessary.

Then there is the question of the overlapping of the rubber and the plastics industries and the duplication of some raw material requirements as well as product uses of these two industries.

For greatest efficiency there should be a director of production for the rubber, plastics, and associated industries, with authority to see that the materials, manpower, and techniques are available when required for supplying rubber and plastic products for military and necessary civilian needs.

As Mr. Collyer stated recently, we must face realistically that our entire American economy will be on a wartime, or preparation-for-war basis, for some time to come. We must maintain effective military strength and yet solve the dislocations and problems that this effort thrusts upon our nation.

For the rubber industry this means that natural rubber procurement, distribution, and use; synthetic rubber production, including procurement of the base materials, and the distribution and use of the finished rubber; chemical and textile parts procurement and distribution; availability of manpower, including technical manpower; and a continuing program of research and development on natural and synthetic rubbers, are all parts of the whole program that must be administered from one central office.

There was too much inertia and uncertainty in the national rubber program during the last half of 1950, at a time when developments abroad pointed to the early need of a comprehensive and coordinated rubber program. If 1951 is to be the first year of an all-out new defense effort, we should have enough background of experience from World War II and the postwar years to plan and administer a program for the rubber industry which will include the needs of the plastics industry and those industries supplying component parts that will really do the job with the minimum of duplication and waste motion.

If World War III becomes inevitable, the free, democratic peoples of the world have much less allowable margin of error than they had in World War II and very much less margin than they had in World War I. One way of emphasizing this fact for the rubber industry might be to recall that in World War I our rubber supply was not seriously interfered with; in World War II it was, but we had a pretty good stockpile and built a synthetic rubber industry. If World War III comes in 1951, our stockpile may be inadequate and our synthetic rubber still not a complete replacement for natural rubber.

R. G. Seaman

DEPARTMENT OF
PLASTICS TECHNOLOGY

Vinyl Stabilizers

H. J. Ratti[1]

VINYL stabilizer is an additive to polyvinyl chloride, polyvinylidene chloride, or their copolymers, which extends the useful life of products made from these plastic materials. The vinyl stabilizer must not only protect and extend the life of the resins, but must also be compatible with, and extend, the time through which the desirable properties of all the other constituents of the vinyl compound are maintained. Plastic products made from the resins are generally modified by colorants, plasticizers, and fillers to make them adaptable to a wide variety of end-usages.

Enough data are available for us to accept as a major premise that two mechanisms are involved when polyvinyl chloride degrades. They are: (1) the splitting out of hydrogen chloride, resulting eventually in conjugated polymer unsaturation and the formation of color bearing polyene systems; and (2) the simultaneous oxidation of such unsaturated systems. In general, these two mechanisms are both in operation when polyvinyl chloride degrades, regardless of whether the degrading agency is heat or light. The energy source seems simply to change the relative rates of hydrogen chloride formation and oxidation. When heat is the primary degrading influence, hydrogen chloride formation seems to play the major role in the breakdown, with oxidation playing a secondary part in the mechanism. When ultra-violet light is the primary energy source, oxidation seems to be the predominant cause of vinyl failures. The inter-relation of these two types of degradation reactions is evidenced by the catalytic effect of hydrogen chloride on the oxidation step.

This short treatment of polyvinyl chloride breakdown is not intended to cover all of the phases of the mechanism. Much work still needs to be done to extend the industry's knowledge in this field.

The foregoing, however, is sufficient background for establishing a systematic approach to the stabilization problem.

We can also accept without any great degree of reservation, the thought that an ideal stabilizer system should embody the best possible compromise of the four following essentials:

(1) Hydrogen chloride acceptor;
(2) Reactive dienophilic molecule;
(3) Antioxidant;
(4) Ultra-violet light screen.

An ideal stabilizer would be a product or combination of products having all the above-mentioned virtues, no faults, and a volume cost in the range of that of the resin.

Vinyl stabilizers are generally considered, largely from the standpoint of their role as resin stabilizers. They should also prevent plasticizer breakdown in flexible vinyl products, or, at the very least, the stabilizer should not contribute to the breakdown of the plasticizer.

Classification of Plasticizers

Since there are a considerable number of plasticizers of several different chemical compositions in use, some sort of plasticizer classification is necessary to a proper application of the available stabilizers.

The following brief classification may be used as a guide:

(1) *Organic Ester Type*—phthalates, adipates, sebacates, azelates, etc.

(2) *Inorganic Ester Type*—aryl phosphates, alkyl phosphates, aryl-alkyl phosphates, etc.

(3) *Oil Type*—Polyethylene glycol ester, and natural unsaturated oil derivatives.

(This classification is based on the consideration that both the carbon-to-carbon unsaturated bond and the ether linkage are readily oxidized. Plasticizers containing these groupings are subject to break up and may lose their original compatibility in the vinyl compound and, as a result, may spew.)

(4) *Polymeric Type*—polyesters and nitrile rubbers.

(5) *Miscellaneous*—Nitriles, amides, hydrocarbons, sulfur containing materials.

We have now completed our consideration of vinyl compounds with the exception of colorants and fillers. Because of the necessary complexity of a consideration involving these constituents, this paper will be concerned primarily with resin-plasticizer-stabilizer combinations.

A considerable number of stabilizers are available to the vinyl compounder. They may be listed as compounds of lead, calcium, cadmium, and barium, strontium, tin, potassium, sodium, and certain wholly organic compounds.

Of this list, the lead, sodium, and potassium products are available both as organic and inorganic compounds; while the other metals are available in organic combinations. In addition to the metallic salts, there are a number of purely organic materials which are vinyl stabilizers.

Lead Stabilizers

Inorganic lead compounds were among the first to be considered as vinyl stabilizers. Two of the initial uses of vinyl resins were electrical insulation and surface coatings. Lead compounds had been successfully used and were well known in both these fields for many years prior to the advent of large-scale vinyl production.

Litharge (lead monoxide) and white lead were the first two products to be used, since they were moderately priced and readily available. They are excellent acid acceptors, and, insofar as their electrical applications are concerned, they are a good choice, with reservations. The litharge is 100% available to form lead chloride, and proves to be too reactive with plasticizers and other compound constitutents. Besides this fault, litharge is not stable in color.

White lead (basic lead carbonate) is color stable, but has two major faults. While its lead content is entirely available for taking up hydrogen chloride, only 28-31% of the total of 80% metallic lead content is safely available. Beyond this smaller basic lead content, the formation of more lead chloride results in the release of carbon dioxide, which is not desirable. Whereas basic lead carbonate may be safely used as an acid acceptor, within the limits which have been given, the practice has its doubtful aspects.

The use of these two lead compounds was quickly followed by the introduction of hydrous basic lead silicate, and by lead orthosilicate-silica gel complexes. Both of these materials represented an advance.

The *hydrous basic lead silicate* provides safely available basic lead to take up hydrogen chloride to approximately the same extent as white lead, but without the gassing tendency of basic lead carbonate. Electrical characteristics of vinyl compounds containing the hydrous basic lead silicate are good. Occasional trouble is encountered owing to absorbed moisture.

The *lead orthosilicate-silica gel complexes*, while not exceptional as heat stabilizers, embodied three other good characteristics: namely, (1) excellent volume-cost considerations, (2) low tinting strength making deep shades possible, and (3 silica gel content with the capacity to absorb and retain considerable amounts of the breakdown products of some "not too stable" secondary plasticizers which often are used to improve low temperature flex, drape, and hand in calendered stocks.

This was about the status of available lead stabilizers when the National Lead Co. started its vinyl stabilizer development program. It was quite natural that lead compounds received first consideration as stabilizers. As a matter of fact, there were more than 300 compounds from which to choose.

The first choice from the available inorganic lead compounds was *hydrous tribasic lead sulfate*, the best attempt at making a "white litharge." It is the most basic, color stable, white lead compound available. Other lead compounds, such as the basic chlorides and pentabasic lead salicylate are more basic, but they are not color-constant on exposure to light.

Tribasic lead sulfate had all of the attributes of white lead and litharge, with none of their outstanding faults. On the

[1] Research laboratories, National Lead Co., 105 York St., Brooklyn 1, N. Y.

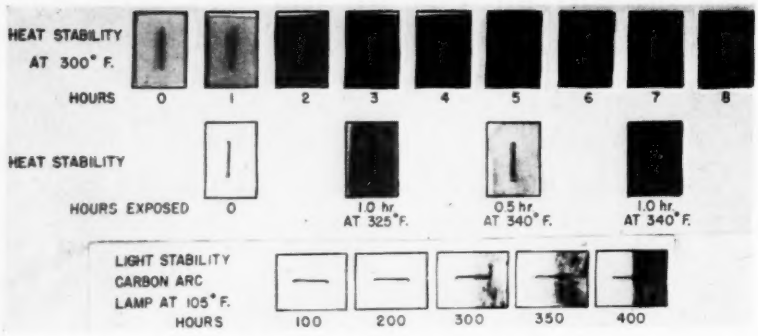
HEAT STABILITY
AT 300° F.
HOURS 0 1 2 3 4 5 6 7 8
HEAT STABILITY
HOURS EXPOSED 0
1.0 hr. AT 325°F.
0.5 hr. AT 340° F.
1.0 hr. AT 340° F.
LIGHT STABILITY
CARBON ARC
LAMP AT 105° F.
HOURS 100 200 300 350 400

Fig. 1. Heat and Light Aging of Vinyl Test Specimens Containing a Clear Lead Stabilizer of Ordinary Merit

other hand, it was only one out of 300 possibilities, and, used alone, it was generally only good as a heat stabilizer. It was possible by its use to produce good electrical insulation stocks, and to impart heat stability to vinyl products not intended for exposure to light.

At about this time a National Lead research laboratory test program on other lead compounds was established. Two other stabilizers emerged from this laboratory evaluation. They were *dibasic lead phthalate* and *dibasic lead stearate*. These products, together with two lead orthosilicate-silica gel complexes for use in translucent stocks, constituted National Leads' first products.

Industry contacts had indicated a need of new and good stabilizers and had been most helpful in suggesting the general types of products required. Two things were apparent:

(1) A realistic test program was needed.

(2) More knowledge of the mechanism of vinyl degradation was needed so that the approach to the problem of stabilization could be made more objective.

Testing Vinyl Compounds

A simple basic test program was established, which has since been greatly expanded. It started with a standard dry batch preblending and milling procedure on a 65-part resin, 35-part DOP compound, to which one, two, 3.2, and five parts of stabilizers (based on the total compound) were added. Following the milling, a portion of the batch was sheeted off at 80 mils, and the pieces were preheated and then pressed in a mold at 300° F. and 2,000 psi. pressure. This procedure gave the equivalent of 30 minutes of heat processing history before the samples were further tested. The molded test piece was die-cut into strips, which were heat-aged in an electrical warm-air oven at 300° F. for periods of from one hour to eight hours. The rest of the batch was sheeted off the mill at 10 to 12 mils, and these thin samples were heat treated for ½ hour at 325° F., and ½ and one hour at 340° F., in an electric warm-air oven. Other portions of the 10 to 12 mil sheet were used for light aging tests. This basic test procedure is still in effect.

A considerable number of tests were made, using one, two, 3.25, and five parts of stabilizer. These tests indicated that one part of the stabilizer was not enough for satisfactory stabilization, that two parts were barely adequate, but over the threshold, and that 3.25 parts on the compound were a satisfactory amount. Thereafter all subsequent testing with stabilizers of all manufacturers was done on 3.25 parts of stabilizer on the compound (65% resin), or five parts based on the resin.

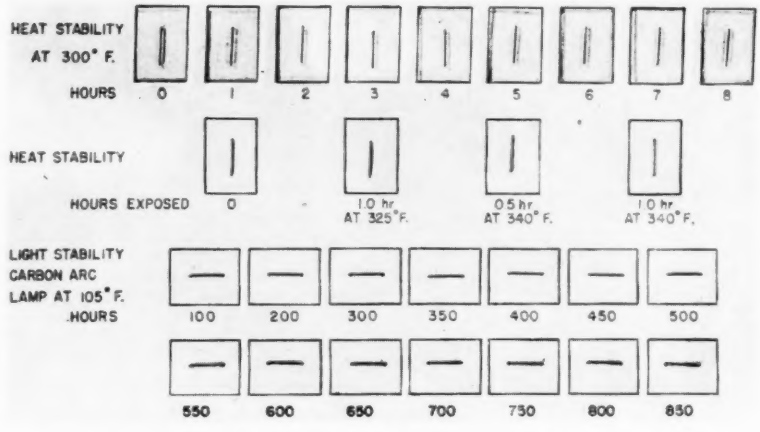
HEAT STABILITY
AT 300° F.
HOURS 0 1 2 3 4 5 6 7 8
HEAT STABILITY
HOURS EXPOSED 0
1.0 hr. AT 325°F.
0.5 hr. AT 340° F.
1.0 hr. AT 340° F.
LIGHT STABILITY
CARBON ARC
LAMP AT 105° F.
HOURS 100 200 300 350 400 450 500
550 600 650 700 750 800 850

Fig. 2. Heat and Light Aging of Vinyl Test Specimens Containing a Good Clear Lead Stabilizer

Light Aging Tests

At the start of the testing program, accelerated light aging tests were run both with an Atlas Weatherometer (Model BWM-C) operated without water spray at about 105° F. and also with an S-1 Type mercury vapor sunlamp. The mercury vapor-type test was soon abandoned, since it did not correlate with outdoor exposure tests in Florida or at Sayville, Long Island; whereas good correlation was found to be possible in the Weatherometer.

This testing procedure makes it possible to get good heat aging evaluations, both on thick and thin sections, which may be translated into processing equivalents on extruders, press-polishing operations, and calendering. On the thin sheet with a short history on the mill (four minutes at 250° F. for chloride-acetate copolymers, or the same time at 275° F. for straight PVC), it is possible to get a good picture on light stability without appreciable influence from heat.

Figure 1 illustrates the results of heat and light stability tests on a polyvinyl chloride formulation, by the method we have just described. It constitutes the test history of a clear stabilizer of very ordinary merit. The clear stabilizer is used so that pigmentation does not interfere with a true evaluation of color breakdown.

On the top row, 80 mil samples are tested for heat stability at 300° F. for periods of up to eight hours in an electric air oven. The sample at 0 hours at the extreme left represents approximately ½ hour of heat history. It is apparent that the stabilizer is only good for one hour at 300° F. on the thick sections, and it will be noted that some color did develop in the 0-hour sample.

In the second row of 10 to 12 mil film test specimens, the 0-hour sample at the extreme left has only four minutes of heat history on the mill at 250° F. The one next to this shows what happens after one hour at 325° F. The third sample shows the effect of ½-hour exposure at 340° F., and the fourth indicates the condition of the sample after one hour at 340° F.

The third row of samples gives the light stability performance of 12 mil films exposed in a Model BWM-C Atlas Weatherometer, operated at 105° F. without water spray. The left half of the sample was covered, and the right half exposed to the effects of the carbon arc. Failure is apparent at 300 hours and complete at 400.

Figure 2 is a duplication of the test procedure shown in Figure 1, but in this case a clear vinyl stabilizer has been used which gives better performance. Here it may be seen that good heat stability is manifested throughout all phases of the test, and light stability is between 800 and 850 hours, with only a slight color break at 850 hours, which may not be apparent in the illustration.

Stabilizers for clear vinyls are available which give performance on heat exposure similar to that illustrated in Figure 2 and with outstanding light stability in excess of 2,100 hours.

Attempts to accelerate light testing by using a Model FDA-R Fade-O-Meter have been confusing. Although tests are faster and might be satisfactory for plant control, heat and light effects are intermixed to such an extent that they have little significance in development work.

The above procedure, as finally modified, was extended to include National Lead stabilizers with a great number of plasticizers and plasticizer combinations, resin and resin combinations, and stabilizers and stabilizer combinations of manufacturers.

The story told by these tests has been extremely worthwhile. It is always available to anyone in the industry who feels that it may be of benefit. It points up many of the advantages and the limitations of stabilizers of all types, with resins and plasticizers of all types.

The test results on lead stabilizers may be summarized, as follows:

(1) Highly basic lead stabilizers are excellent for use with Type 1—Organic Ester Type plasticizers—phthalates, adipates, sebacates, azelates, etc., and with

Type 4—Polymeric Type of plasticizers.

(2) Highly basic lead salts should not be used in compounds containing appreciable amounts of Type 2—Inorganic Ester Type plasticizers, particularly the aryl phosphates. Lead silicate-silica gel complex stabilizers with small amounts of normal lead salicylate are indicated with such plasticizers.

(3) Highly basic lead stabilizers should not be used with Type 3—Oil Type plasticizers, since basic lead salts do not work well with such readily oxidizable materials. Lead silicate-silica gel complexes are indicated here since in addition to giving good performance on heat and light aging, they serve the further purpose of cutting down the tendency of such plasticizers, or their breakdown products, to spew on aging.

Vinyl Degradation Studies

National Lead's study of the mechanism of polyvinyl chloride degradation was also another extremely good example of the cooperation possible where a real industry problem exists, where the cause is good, and the anticipated results add to an industry's fund of general knowledge. An excellent literature background was available. To this literature background, ideas supplied by many members of the industry were added. We also had a few ideas of our own to contribute. Out of all this grew a postulated ideal stabilizer system embodying the four essentials of a polyvinyl chloride stabilizer. These four essentials provided an excellent general pattern to follow in stabilizer evaluations.

The pattern emphasized the importance of stabilizer compounds which could (1) act to block resin unsaturation by forming adducts, (2) be preferentially oxidized instead of the resin and the plasticizer, and (3) act as ultra-violet light screens to protect vinyl products. Stabilizers needed to be more than merely acid acceptors.

Fortunately, in the Fox-Hendricks paper[2] on the mechanism of vinyl degradation, a test procedure was contributed which pinned down the presence of keto unsaturated groupings in degraded polyvinyl chloride. It also indicated the role that such groupings play in color formation in the heat and light degradation mechanism, and showed how certain types of compounds are able to act as antioxidants (and possibly as reactive molecules) to cut down oxidative degradation effects. The immediate effect of this knowledge, added to what was already available, was that it was possible to screen 290-odd untested lead salts quickly with very good results.

The most practical example of the application of this work was the development of *dibasic lead phosphite* as a stabilizer. "Dyphos" (dibasic lead phosphite) was not new as a compound; it had been under development for some ten years. It was a good pigment, but at the time was too costly, since there was no real production of phosphorus acid when it was originally produced. Phosphorus acid, at $5 a pound, was a laboratory curiosity. Owing largely to the vinyl industry's interest in it, this raw material is now in adequate supply at a much lower cost.

As a result of this screening of lead compounds, it was determined that approximately 30 out of the 300 total have good stabilizing characteristics. With one or two exceptions, the good stabilizers are basic compounds of lead. Ten of these lead stabilizers have been marketed, because they do the job as well or better than the others, and generally at a lower cost to the user. The remaining 20 are available at such time as a specific need for them exists, or when raw material costs become lower.

[2] "Degradation and Stabilization of Polyvinyl Chloride." W. W. Fox, J. G. Hendricks , H. J. Ratti, *Ind. Eng. Chem.*, Aug., 1949, p. 1774.

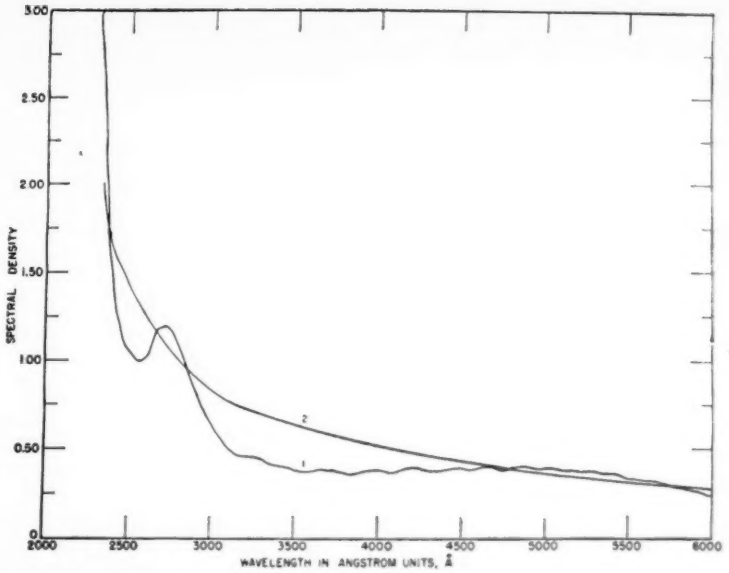

Fig. 3. Characteristic Light Absorption Curves for Polyvinyl Chloride Both Unstabilized and Stabilized with Dibutyl Tin Dilaurate

Heated in 150° C. in a Stainless Steel Mold at 7,000 psi. for Five Minutes: Sample Thickness, 0.14 — Centimeter; No. 1 — Unstabilized; No. 2 — Stabilized with 2% Dibutyl Tin Dilaurate

Other Stabilizers

Calcium Stabilizers

Calcium compounds were an early consideration as vinyl stabilizers. We have been told that in the early days of extruded vinyls a big advance in the art was the use of calcium hydrate. While admittedly better products are available today, it was explained that throwing a little hydrated lime into the batch (although not perfect by any means) eliminated the quite frequent necessity for the extruded operator to put on a gas mask and dig degraded compound out of the extruder.

Much better compounds of calcium are now available. Among them are calcium aceto-acetate which does an excellent job in a number of applications, and calcium stearate. At present calcium stearate has little competition as a non-toxic stabilizer for such applications as food packaging. The principal fault of the stearate is that it gives some difficulty in heat-sealing operations.

Cadmium Stabilizers

A number of organic salts of cadmium are very good stabilizers for protecting vinyl compounds against exposure to light and heat. Among these are cadmium mercaptide, cadmium 2-ethyl hexoate, cadmium ricinoleate, and cadmium napthenate. Some cadmium stabilizers work quite well when used with barium stabilizers. These cadmium-barium combinations provide better all-around heat and light stability than is possible when either material is used alone.

The high price of cadmium somewhat restricts the use of its compounds. On the other hand, a number of moderately priced products in which cadmium is present as a constituent, together with other desirable materials, are available. These do a good job at not too high a cost.

Barium Stabilizers

Three products immediately come to mind in this classification. The first two are barium stearate, a stabilizer-lubricant; and barium ricinoleate. The latter is by itself an excellent stabilizer for clears, and in addition, as stated above, it exhibits a synergistic effect when used in combination with cadmium stabilizers.

The third product is a peptized barium ricinoleate, which gives enhanced clarity, heat and light stability.

Barium stabilizers are indicated for use where other types of products cannot be utilized, such as in environments where sulfide staining is a strong possibility and necessarily must be avoided.

Strontium Stabilizers

Strontium naphthenate is the only widely used strontium compound. It offers good light stability in clears.

Tin Stabilizers

A number of organometallic tin compounds are available in which either two, or all four valences of the tin are satisfied by organic groupings. Among them are dibutyl tin dilaurate, dibutyl tin maleate, dibutyl tin oxide, and a complex organic tin salt.

The first of these in general use was dibutyl tin dilaurate. It probably functions in three ways: as an acid acceptor, as an antioxidant, and possibly as a dienophile. It produces clear vinyl compounds unsurpassed in general quality and clarity.

This product fortunately was quite adaptable to being submitted to ultra-violet and infrared light studies in a system consisting of only polyvinyl chloride and stabilizer. By its use it was possible to add to the general knowledge of polyvinyl chloride degradation and its stabilization.

Figure 3, a part of a previously given paper,[3] illustrates how this product pro-

[3] *Ibid.*, p. 1777.

tects polyvinyl chloride resin from degrading. In curve 1 of Figure 3, unstabilized polyvinyl chloride shows a strong absorption peak about 2700 Å, indicating the presence of carbonyl groupings in heat degraded polyvinyl chloride resin, formed by oxidation of the heat-induced polyene systems. Proof of the indicated carbonyl groupings at 2700 Å was obtained in the infrared region. The additional absorption peaks (waviness in the curve) at higher wave lengths agrees with the theory of formulation of longer polyene groupings after longer heat treatment and resultant additional degradation.

Curve 2, for polyvinyl chloride stabilized with 2% dibutyl tin dilaurate, having no characteristic peaks or inflations, indicates that little or no carbonyl or polyene is present, which point is proof of the excellent stabilizing characteristics of this tin salt.

Ever since the Fox-Hendricks test procedure was established,[4] efforts have been made to get other products which will as graphically illustrate the stabilization mechanism in light studies. Thus far, such work has been to no avail.

By selecting a compound with the same general working characteristics, however, it has been possible to develop a stabilizer for clears having reasonably good heat stability, excellent light stability, and a very good degree of clarity, not equalling, but approaching the clarity of tin salts. Tentatively, it appears probable that this new development will be less expensive than the tin stabilizers and will always be readily available.

Sodium and Potassium Compounds

The first of this class of compounds to be used in vinyls was sodium carbonate. Merely an acid neutralizing agent, it was not seriously considered because of the gassing produced by the liberation of carbon dioxide.

Sodium phosphate is a more useful alkaline inorganic salt. This has been found to give reasonably good light stability, but is somewhat restricted by lack of reserve heat stability. Several sodium alkyl phosphates are in wide usage today. Their light stability characteristics are excellent, and in combination with heat stabilizers all of these phosphates, organic and inorganic, give very satisfactory performance.

Organic Compounds

The most logical class of organic compounds to be considered as vinyl stabilizers would appear to be the amines because of their well-known ability to combine with hydrogen chloride. Unfortunately, one finds that these amines and other nitrogen bearing materials are very sensitive to heat and undergo severe breakdown, even in the presence of ordinarily good heat stabilizers.

The most promising class of organic stabilizers is the epoxy compounds. The currently available compounds of this type produce clear films of reasonably good heat and light stability. They are best used in applications which do not involve severe heat conditions.

Many other organic compounds appear to be of some value, but are not as useful in their all-around stabilizing properties as the epoxy compounds.

Summary

From the foregoing it is quite plain that a considerable number of good stabilizers are available to the compounder. Further advances will undoubtedly be made which will nullify some earlier efforts. The ideal has not yet been attained. A perfect stabilizer would be one embodying the four essentials that have been stressed. In addition, it must produce clears and must also be non-toxic. No product, presently available, has all of these virtues.

[4] *Ibid.*, p. 1775.

SPE National Technical Conference; Sections Meet

DETAILS on the program for the seventh annual National Technical Conference of the Society of Plastics Engineers, Inc., to be held January 18-20 at the Hotel Statler, New York, N. Y., appeared in our December issue (page 324). Previously unavailable abstracts of two papers listed on the technical program have now been received and are given below.

January 18, 11:15 a.m. **"Plastics Industry in Great Britain."** H. V. Potter, British Plastics Federation, London, England.

An outline will be given of the general organization of the plastics industry in Great Britain, including the functions of some of the trade and scientific groups such as the British Plastics Federation, the Plastics Institute, the Society of Chemical Industry (Plastics and Polymer Group), the Association of British Chemical Manufacturers, and the Association of Chemical & Allied Employers (Plastics Group). The relations of these groups to the development and working of the British plastics industry will be considered.

The paper will also include a discussion of the raw materials position, the expansion of the British plastics industry during recent years, probable future trends of the industry, the functions of some other groups connected with the plastics industry, and some statistics on the industry in Great Britain.

January 20, 9:30 a.m. **"Plastisol Molding."** C. W. Patton, Bakelite Division, Union Carbide & Carbon Corp., New York.

After a review of the history and background of plastisol molding, this paper will deal with the current status of this field of the plastics industry. Topics covered include compounding and processing of plastisols; different methods of molding plastisols, including flush molding; examples of typical applications; and trimming, finishing, and decorating molded items.

Symposium on Molding

A symposium on molding problems featured the November 20 dinner-meeting of the Rochester Section, SPE, held at Lorenzo's Restaurant, Rochester, N. Y., with some 27 members and guests attending. Panel members were I. Copland, Monroe Plastics, Inc.; J. Grabowski, American Cyanamid Co.; G. Delaire, Eastman Kodak Co.; G. Erdle, Erdle Mfg. Co.; W. Ross, Diemolding Corp.; and E. Palmer, Stromberg-Carlson Co.

The panel members answered questions on molding problems from the floor. To strengthen a phenolic part for a gas grenade the panel recommended the use of lower molding pressure and larger gating. To eliminate gas bubbles in a thermoplastic plug, the panel suggested that turbulence be reduced by the use of smaller gating, longer runners entering toward the rear of the cavity, and a runner extension to remove "cold slugs." On the possibility of gating on the inside of telephone handles rather than at the center or both ends, the panel stated that such gating would be difficult owing to the complexity of the core insert.

Chicago Sections Celebrate

More than 300 members, guests, and their wives attended the first annual joint Christmas dinner-dance of the Chicago Section, SPE, and the Midwest Chapter, SPI, on December 9 at the Edgewater Beach Hotel, Chicago, Ill. The program included a cocktail hour, dinner, floor show of night-club acts, and an evening of dancing. Arrangements were handled by a committee headed by Bill Snow, Snow Plastics Corp., and including W. K. Woodruff, Celanese Corp. of America; Ben W. Rau, G. Felsenthal & Sons, Inc.; and Lee J. Swift, Sandee Mfg. Co.

Prize Paper Winners

The annual Christmas party of the Cleveland-Akron Section was held December 11 at the Aurora Inn, Aurora, O. Some 75 members, guests, and their wives attended the party, which included a cocktail hour, dinner, and an evening of dancing. The ladies present were presented with table favors, and everyone attending the party received a door prize.

M. W. Osborne, B. F. Goodrich Chemical Co., in charge of the Section's Prize Paper Contest, announced that the judging committee headed by Hugh Winn, Firestone Tire & Rubber Co., had awarded first prize to the paper, "Industrial Applications of Polyethylene," by Prof. George Blum, Case Institute of Technology. Second prize was won by A. R. Morse, Injection Molders Supply Co., for his paper, "Production Aids for the Injection Molder." Both papers have been entered in the SPE National Prize Paper Contest.

The November 27 meeting of the Section was snowed out by a blizzard. Warren Stubblebine, Army Quartermaster Corps, had been scheduled to talk on "Plastics Uses in the Armed Forces" at this meeting, and it is hoped that Dr. Stubblebine will be able to present his talk at the Section's January meeting.

Newark Section Officers

In place of the regular technical meeting, the Newark Section held a Christmas meeting on December 13 at the Military Park Hotel, Newark, N. J. Some 75 members and guests enjoyed dinner and a social evening. Entertainment was provided by the Montclair Barbershop Quartet; table favors were distributed through the courtesy of George Staub, Sterling Plastics Co.; and there was a drawing for door prizes contributed by Fritz Mitch, Newark Die Co.; Russell Akin, E. I. du Pont de Nemours & Co., Inc.; and Ernest Cezara, Eagle Tool Co.

The new 1951 officers of the Section were announced as follows: president, Peter W. Simmons, Dow Chemical Co.; vice president, Jack R. Pecktal, Tennessee Eastman Co.; and secretary-treasurer, Edward W. Rowan, Dillon-Beck Mfg. Co. Newly elected to serve three-year terms as directors were Mr. Pecktal, Joseph E.

Meyer, General Electric Co., and Joseph L. Bonanno, Lionel Corp. Other directors of the group include A. A. Kaufman, Industrial Synthetics Corp.; W. W. Waters, Watson-Stillman Co.; Mr. Rowan; E. L. Fortney, Fortney Mfg. Co.; and Roland Frackenpohl, Newark Die Co.

Plastics for Defense

A talk on the present position of plastics in the defense program, by Edmund Childs, Monsanto Chemical Co., highlighted the December 6 dinner-meeting of the Western New England Section at the Hotel Sheraton, Springfield, Mass. In the business session preceding the talk, the following new officers and directors of the Section were announced: president, H. H. Hasenzahl, American Optical Co.; vice president, M. H. Nickerson, DeBell & Richardson, Inc.; secretary, R. W. Crawford, Monsanto; treasurer, Emil Marciniak, A. G. Spalding & Bros., Inc.; and directors, Louis Peterson, Pro-phy-lac-tic Brush Co., Paul Holmberg, Arrow-Hart & Hegeman Electric Co., and R. Thuse, Monsanto.

Mr. Childs stated that the requirements of the Armed Services are largely determined by the terrain in which we fight, and the present established service temperature limits are —65 to +165° F. Another important military requirement is portability, and great emphasis is placed on the weight of the equipment. In this connection the speaker noted that the Services tend to distrust the use of thermoplastics for molded rifle stocks despite their lightness. Acrylics are being used widely as soil stabilizer resins. In general, cellulosics do not withstand low temperatures, but cellulose acetate is being used in rocket inhibiter strips. Cellulose acetate butyrate is not in general use. Nylon is used for bearings and wire jacketing, and polyethylene is widely used in applications where its chemical inertness is advantageous, such as rocket igniter cups. Polytetrafluoroethylene chloride resins are of great interest, but are new and in short supply.

The capacity for polyvinyl chloride production is considered good and may not be in short supply, Mr. Childs said. Polyvinyl alcohol film is used as a barrier material for oils and war gases; while polyvinyl butyral is plentiful in supply and is used in laminated acrylic sandwiches for enclosures. Polystyrene is in short supply, but has limited military use because of its properties. Alkyd molding compounds are too new for wide use and lack a background in application and performance characteristics. Melamines have poor dimensional stability and are, therefore, limited in application. Great emphasis is being placed on polyester-glass laminates for various applications, the speaker noted. The urea compounds will probably be adequately available, but lack any special new applications. The Epon resins are of great interest, but are still relatively new and untried.

Holds Christmas Party

The New York Section held its second annual Christmas party on December 20 at the Hotel Shelburne, New York. Some 55 members and guests were present at the party, which included a cocktail hour, dinner, and entertainment program. A feature of the evening was the announcement of the Sections' new officers for the coming year, as follows: president, George Baron, Ideal Plastics Corp.; vice president, Bruno E. Wessinger, Wess Plastic Molds, Inc.; and secretary-treasurer, Winslow A. Ward, American Cyanamid Co. In the recent mail balloting, the following were elected to the board of directors to serve three-year terms: Saul Blitz, Noma Electric Corp.; Russell H. Skidmore, Celanese Corp. of America; and A. M. Merrill, India RUBBER WORLD.

Table favors were distributed through the courtesy of Koppers Co., Inc., and Renwal Mfg. Co., Inc., and the party closed with a drawing for grab-bag prizes and for door prizes contributed by F. J. Stokes Machine Co., H. Muehlstein Co., Noma Electric, and Wess Plastic Molds, Inc. The party was voted a huge success, and credit for the affair should go to the committee in charge, under the chairmanship of Mr. Ward and including M. J. Voetglen, Celanese Corp., Walter Merck, M. W. Kellogg Co., and N. V. Fasano, Washington Molding Co.

SPI Sheeting Conference

THE Plastics Film, Sheeting, and Coated Fabrics Division of the Society of the Plastics Industry, Inc., held its second conference on December 14 and 15 at the Hotel Commodore, New York, N. Y. Approximately 500 persons representing all phases of this plastics field attended the two-day conference at which papers were presented on subjects of interest to both management and technicians.

December 14 Session

Three papers were presented at the morning session, presided over by A. M. Ross, Ross & Roberts, Inc., as follows: "A Review of Vinyl Embossing," H. S. Vohs, Roehlen Engraving Works, Inc.; "Color Problems in Vinyl Film and Sheeting," F. G. Clark, Bakelite Division, Union Carbide & Carbon Corp.; and "Surface Coatings and Free Films from Organosols and Plastisols," G. E. Stevenson, Weymouth Art Leather Co.

Mr. Vohs discussed the comparative advantages of roller and flat plate embossing, the problems presented in the preheating of plastics film prior to embossing, and the growing tendency toward use of low-pressure roll embossing and embossing directly against the last roll of a calender.

Mr. Clark's paper concerned the manufacture of good colored vinyl film and sheeting from the viewpoints of (1) problems encountered in the manufacturing process, (2) aging problems after the film or sheeting is made, and (3) cost factors in choosing colorants. The speaker emphasized that the coloring of vinyl is a complex job which requires a great deal of preliminary work, and that colorants of unknown behavior should not replace known and approved colorants.

Mr. Stevenson discussed organosols in comparison with plastisols and solution casting in the manufacture of continuous film. Plasticizers, solvents, diluents, and colorants used in the organosol process were described, together with the techniques involved and the advantages of the process.

H. R. Thies, Goodyear Tire & Rubber Co., presided over the afternoon session which began with a luncheon, followed by the presentation of four papers, as follows: "The Values of Marketing Research," V. D. Reed, J. Walter Thompson Co.; "Film and Sheeting Products at the Retail Level," Ephraim Freedman, R. H. Macy & Co., Inc.; "A Report on the Progress of the SPI Standards Committee," A. J. Hanley, Respro, Inc.; and "Radio-Active Static Eliminators for Improving Quality of Printed Vinyl Films and Eliminating Fire Hazards," R. L. Jenkins, Canadian Radium & Uranium Corp.

Mr. Reed's talk detailed the techniques involved in market research and the values to be gained. Mr. Freedman analyzed consumer reactions to the use of vinyl shower curtains, table cloths, rainwear, yard goods, garment bags, aprons, infants' furniture, luggage, card table covers, and furniture upholstery; he urged the use of informative labels to insure continued expansion in applications. Mr. Jenkins described the use of a polonium bar placed within one inch of a printed film to remove static electricity, particularly in multicolor printing where the film builds up a high level of static electricity prior to the final color printing.

December 15 Program

G. S. Laaff, Bolta Co., was in the chair at the morning session, at which the following three papers were presented: "Accurate Temperature Control for Calenders and Presses," P. L. Geiringer, American Hydrotherm Corp.; "Vinyl Fabrics for Furniture — Today and Tomorrow," W. S. Marder, Daystrom Corp.; and "Merchandising Vinyl Upholstered Furniture," R. S. Schwartz, Spiegel, Inc.

Mr. Geiringer's paper on the advantages of Hydrotherm heating of calenders and presses was similar to his paper published in our July, 1950, issue. In discussing vinyl furniture fabrics, Mr. Marder stressed the need of color-fastness standards; better definition of defects; and trends in color, style, and texture, with the need of more warmth in patterns and colors. Mr. Schwartz discussed selection of merchandise, pricing, sales training, presentation, and promotion from the viewpoints of the raw materials manufacturer, vinyl fabricator, furniture manufacturer, and the retailer.

The afternoon session, with F. S. Strauss, Harte & Co., Inc., as chairman, began with a luncheon and included the presentation of two papers and a panel discussion. Warren Stubblebine, Office of the Quartermaster General, spoke on "Material Needs of the Armed Services," and R. E. Lally, Ferro Chemical Corp., dealt with "Recent Developments in Stabilizers." Dr. Stubblebine discussed work by the Armed Services on the adoption and use of vinyl gun covers, bags, and liners, vinyl coated papers and fabrics, and vinyl coatings for flameproofing textiles.

Five speakers participated in the panel discussion on the materials supply situation. H. J. Ratti, National Lead Co., considered vinyl stabilizers and pointed out that supplies should be adequate during 1951 and the predictable future. The pigment supply situation was presented by S. L. Karpeles, Imperial Paper & Color Corp., who noted that reasonably good supplies can be expected in chrome yellows, chrome oranges, chrome greens, molybdate orange, and iron blue in the inorganic field; while cadmium yellows, cadmium oranges, cadmium reds, chromium oxide, zinc chromate, iron oxides, carbon blacks, all white pigments, and ultramarine blue will be comparatively tight. In the organic pigment field, no great tightness is excepted in phthalocyanine blues and greens.

The resin supply situation was covered by G. A. Fowles, B. F. Goodrich Chemical Co., who stated that the vinyl industry would produce and use almost 300,000,000 pounds of resin in 1950 and will expand facilities in 1951 to an annual capacity of more than 425,000,000 pounds. Vinyl resins will still be in short demand through 1951 because of continued shortages of basic raw

materials, notably chlorine, which will prevent full utilization of plant productive facilities. D. A. Comes, Farrel-Birmingham Co., who spoke on availability of mechanical equipment, stated that all types of machines can be supplied although some substitution of metal components may be made in the equipment. The final panel speaker, W. A. Woodcock, Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corp., treated of plasticizer availability in 1951. Raw materials for phthalate- and phosphate-type plasticizers are in short supply, but a shortage of plasticizers is not anticipated unless 1951 vinyl output greatly exceeds the 1950 level.

New Surface Effects in Vinylite Film Shown

COLORFUL new three-dimensional surface and texture effects on Vinylite vinyl plastic film and sheeting were shown by Bakelite Division, Union Carbide & Carbon Corp., at a press preview on December 7 at the Hotel Delmonico, New York, N. Y. The new surface effects, achieved by molding and forming, were shown in typical applications in a complete home setting, including living room, dinette, game room, bathroom, bedroom, dressing room, nursery, cocktail corner, decorator's studio, and outdoor patio. Cooperating in the display were the following processing companies whose products were employed in the show: Decora Corp.; Forrest Process & Development Corp.; Hedwin Corp.; Jason Corp.; Kalistron, Inc.; Susquehanna Mills, Inc.; Toscony Fabrics, Inc.; and Victory Plastics & Embossing Corp.

In announcing the new surfaced Vinylite plastics, George C. Miller, Bakelite vice president, noted that the new film and sheeting give an appearance that duplicates with excellent fidelity almost any fabric, pattern, or weave, while retaining the inherent advantages of the plastic. In addition, the new surface effects eliminate the coldness of plastics, impart a satisfactory feel, and widens the latitude for color and design hitherto possible with plastics.

Featured in the show were a new lightweight line of Sealtuit stitchless plastic quilting made by Jason Corp. in five patterns and 16 decorator colors, and Coryl formed calendered film produced by Decora Corp. Sealtuit was shown in typical applications such as wall coverings, draperies, upholstery, and coverings for accessories. Coryl formed film, given its first showing to the trade at the preview, has printing, color, and texture on both sides of the film to give uniform thickness, improved feel and drape, and resistance to wrinkling, creasing, and curled edges. This material was shown in draperies, curtains, raincoats, aprons, and yard goods.

Molded Vinylite sheeting to give three-dimensional surface effects much deeper than can be made with film was shown by Forrest Process and Hedwin Corp. These sheetings were utilized in heavy textures and effects in such products as place mats, handbags, and wallets. Film consisting of a laminated layer of clear transparent film on to a printed film, with the laminated material given an embossed fabric finish, was shown by Victory Plastics as yard goods, raincoats, aprons, and umbrellas.

Other interesting surface effects in Vinylite film and sheeting were shown by Kalistron, in the form of draperies, upholstery, wall coverings, and mats; Susquehanna Mills, in the form of draperies and throw rugs; and by Victory Plastics, in various applications, including curtains, draperies, wall coverings, yard goods, etc.

New Surface Finishes and Effects in Vinylite Film and Plastic Shown at Press Preview Included: (1, 2, 5, and 10) Coryl Formed Film Patterns by Decora Corp.; (7 and 8) Sealtuft Stitchless Plastic Quilting by Jason Corp. in Twist and Block Patterns, Respectively; (3) Corde-on-Calf Handbag by Markay Bags, Inc., from Sheeting by Hedwin Corp.; Formed Sheeting by Forrest Process, Used in Croyden Wallet with Milan Straw Effect by Aristocrat Fifth Ave. (4) and in Belt and Handbag with Simulated Needlework by Harry Litwin (6); and (9) Plastimat Place Mat in Tulip Linen Design in Formed Sheeting by Hedwin

Scientific and Technical Activities

Rubber & Plastics Division, ASME, New York Meeting

THE Rubber & Plastics Division of the American Society of Mechanical Engineers held three technical sessions at the Statler Hotel, New York, N. Y., on November 30 and December 1, as part of the annual meeting of the Society. A luncheon of the executive and general committee was also held on November 30.

The Technical Sessions

The first technical session on the morning of November 30 was presided over by George N. Vacca, Bell Telephone Research Laboratories, with Warren E. Scoville, Jr., United States Rubber Co., as vice chairman. In the absence of Frank W. Warner, General Electric Co., chairman of the Division, presiding officers at all three sessions were introduced by W. Newlin Keen, E. I. du Pont de Nemours & Co., Inc., secretary of the Division.

The first paper, entitled "Advances in the Uses of Rubber in Engineering, 1949-50," by L. E. Straka, Goodyear Tire & Rubber Co., consisted of the annual survey of the literature July, 1949 to July, 1950, of special interest to mechanical engineers. The complete paper appears on pages 442-49.

The second paper was devoted to the subject, "Pressures Developed by Viscous Materials in the Screw Extrusion Machine," by William T. Pigott, also of Goodyear. An abstract follows:

"A mathematical analysis is given with supporting data. Previously developed equations describing the pressures and discharge rates of Newtonian liquids in the screw-type pump are briefly discussed and are experimentally verified. These equations were derived on the assumption that the mechanism is one of viscous shearing with no slippage and that the threads are at all times completely filled with liquid.

"These equations are then applied to rubber-like materials for the two extreme conditions of extruder operation: open discharge (with die removed from discharge end of extruder); and zero discharge (with solid plate sealing the discharge end of the extruder).

"For the condition of open discharge of rubber-like materials the discharge rates were found to be much lower than the calculated values. It is concluded that the mechanism for rubber-like materials under this condition is largely one of sliding friction rather than viscous shear and that it is difficult to fill the threads in the charging port when simple strip feeding is used.

"For the condition of closed discharge, calculated pressures agreed with observed pressures using a number of different stocks and a number of different screws. In order to calculate the pressure developed at zero discharge, the apparent viscosity of the stock must be known at the effective rate of shear existing in the extruder. The apparent viscosity of a number of stocks was determined by forcing it through circular orifices at different flow rates and calculating the viscosity from Poiseuille's equation. The effective shear rate was calculated by using an expression for the average volume weighted rate of shear in circular orifices. The plots of apparent viscosity and effective shear rate on log-log paper resulted in straight lines. The effective shear rate occurring in the extruder was calculated for screws with wide thread spacing from the velocity distribution in the threads and an expression for the average volume weighted rate of shear in rectangular orifices. An experiment was devised to determine experimentally the effective shear rate in the extruder at zero discharge. The result agreed with the calculated value. It is concluded that at zero discharge the mechanism for rubber-like materials is one of viscous shearing and that rubber-like materials behave as viscous, but highly thixotropic liquids.

"At discharge rates intermediate between zero and open discharge (discharge port partly open) the mechanism for rubber-like materials is one of sliding friction in the low pressure areas of the screw near the feed port and one of viscous shearing near the discharge port where the pressure is the highest. For this reason it is difficult to estimate the pressure for rubber-like materials at any condition other than zero discharge using equations based upon a mechanism of viscous shearing."

The second session during the afternoon of November 30 was held under the joint auspices of the Machine Design and Rubber & Plastics divisions and was in the form of a symposium on sealing and packing materials of rubber and plastics. A record attendance of about 150 members and guests was present at this session. The chairman was Sherman R. Doner, Manhattan Rubber Division, Raybestos-Manhattan, Inc., and the vice chairman, D. J. Buckley, Standard Oil Development Co.

The first paper was presented by E. F. Riesing and H. H. Klein, of National Motor Bearing Co., and was an illustrated presentation covering the improvements and advancements in the technique of preventing leakage of fluids, gases, lubricants, and foreign materials through revolving shaft openings in bearing housings, gear boxes, hubs, etc., by means of the unitized radial contact shaft seal.

A plurality of designs of the unitized radial contact type of seal for revolving shafts was presented with a comparison of relative design features and design trends as well as technical data on various resilient materials currently employed for the functional sealing element engaging the peripherial surface of the shaft. Conditions of shaft surface finish and shaft hardness were also reviewed from the viewpoint of promoting successful long life, leakproof shaft seal performance.

The scope of the paper was broad, covering radial contact shaft sealing problems ranging from low to high temperature operations from small and large shafts under conditions of positive and negative sealing pressures, as encountered in diverse industrial and on vehicular equipment. Included was information on laboratory testing devices for performance data, endurance determination, and power consumption of radial contact unitized shaft seals.

The second paper on the symposium was entitled "Studies of Relaxation Characteristics of Non-Metallic Gasket Materials" and was given by R. G. Farnam, of F. D. Farnam Co. An abstract follows:

"Relaxation in gasket materials has long been recognized. Though studies have been made of this characteristic, its acceptance as a specification requirement in industry is not generally adopted. This paper describes a relatively simple apparatus designed for determining the relaxation characteristics of gasket materials at room and elevated temperatures to simulate actual field conditions. Relaxation characteristics of representative gasket materials chosen from several commonly used types tested under various loads, temperatures, and times, including reloadings, are presented in graphic form.

"These studies, relating to actual field conditions of gasket applications, indicate the close relation between the relaxation characteristics of gasket materials and their engineering performance. Since many failures of performance may reasonably be attributed to the specific relaxation characteristics of the gasket materials, these studies would offer a more realistic and direct method and approach for the evaluation of these gasket materials and for obtaining more accurate and reliable indications of their advantageous uses.

"Non-metallic gaskets, when subjected to flange pressure, all have some degrees of 'let-down' after the original tightening of the flanges.

"This characteristic, which the author has tentatively termed relaxation, is quite familiar to everyone having an intimate knowledge of these materials. It is not only a common cause of gasket leaks, but of many gasket failures. Without particular reference to types or causes of relaxation, it was felt that a very definite need existed of determining the extent of this property in gasket materials. The presently used test method, such as those for determining compression, recuperation, and compression set, although valuable in evaluating gasket materials, do not indicate what will happen to these materials under flange pressure in respect to what is required to maintain a seal.

"Studies of relaxation characteristics in gasket materials are not new. Considerable knowledge concerning the subject of relaxation is already available. The importance of relaxation, however, in respect to evaluating gasket materials has not been generally accepted by industry."

The final paper on the symposium program was "Rubber and Plastic Packing," by F. C. Thorn, Garlock Packing Co., and was in the form of a summary on the subject. In a fairly comprehensive abstract it was said:

"A brief résumé is given of mechanical packings employing rubber or plastics as major constituents. An attempt is made to indicate those properties of rubber and plastics which make them suitable for these uses.

"I. GENERAL. There have been numerous papers recently with respect to two rather specialized types of packing—viz: the O-ring in its dual capacity of sliding contact packing and stationary gasket, and the molded synthetic radial seal. From the angle of these papers the packing industry

might be considered a minor branch of the molded rubber goods industry. Actually, of course, the packing industry is much more extensive and employs practically every material in the animal, vegetable, and mineral kingdom. In addition to natural rubber, synthetic rubber, silicone rubber, and their compounding ingredients, which comprise the materials used in the specialty packings mentioned, we have to deal with phenolic resins, Teflon, nylon, polyethylene, vinyl plastics, acrylic plastics, gelatin, all of the petroleum products, coal distillation products, animal and vegetable resins, fats and waxes, glycerine, glycols, all of the fibers, animal, vegetable, mineral, and synthetic, both loose and in the form of felt, paper, yarn, and fabric, also cork, graphite, and all the metals—cast, rolled, foil, wire, and comminuted. Until recently I would have excluded ceramic materials, but the advent of glass, porcelain, and steatite axial seal elements makes this exclusion no longer feasible. However I am considering at this time only those packing types in which rubber or plastics are responsible for both the service success and the service limitations. Simple rubber moldings comprise but a small proportion of these.

"II. GASKETS. The broad divisions of packings are into gaskets, disks, sliding contact packings, and diaphragms. A gasket is a packing between surfaces in essentially stationary relation. As previously mentioned, the O-ring is used frequently as a gasket. Being a free ring in a groove, it is exposed rather fully to the medium being handled, is used generally in contact with highly finished surfaces, is self-tightening, and its requirements are therefore somewhat special. A more familiar type is perhaps the gasket cut from flat sheet installed in the commercial bolted flange and exposed to the fluid medium on the edge only. Its requirements are basically mechanical rather than chemical. I would list the desired mechanical properties as conformity, retraction modulus, relaxation, compressibility, thermal expansion, coefficient of friction, adhesion to metal, and swelling pressure generated by absorbed fluids. These are not included among the conventional rubber properties, and standard methods for their measurement do not exist at this time."

Considerable discussion followed all the packing symposium papers, and from the large attendance and interest of those present in the subject it appeared that further papers on this subject might be desirable.

The third and final session was held on the morning of December 1 and was also very well attended. Chairman for this session was John Rehner, Jr., Standard Oil, and vice chairman was Russell B. Akin, du Pont.

The first paper was on the subject of "Strength Behavior of Adhesive Bonds" by H. P. Meissner, Massachusetts Institute of Technology, and G. H. Baldauf, Ecusta Paper Corp. An abstract of this paper states:

"Practically all adhesive systems show an increase in strength with decreasing thickness of the adhesive layer. At least five different explanations for this 'thickness-strength' rule have been proposed, based upon the following concepts: (a) molecular orientation of the adhesive; (b) differences in physical structure; (c) theory of flaws; (d) reduction of plastic flow during test; (e) distribution of internal stresses.

"An investigation of these alternatives was made by testing butt joints between metal cylinders using eutectic solder, wax,

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and polystyrene as adhesives. Evidence indicating the correct explanation of the thickness-strength rule was obtained from a study of the effect on bond strength on bond geometry, from the location of bond failure, and from the relations between bond strength and bulk strength."

Considerable discussion on the above points made in this paper was contributed by D. M. Alstadt, Lord Mfg. Co., and R. C. Platow, Bell Labs.

The second paper, "Creep Properties of Lucite and Plexiglas for Tension, Compression, Bending, and Torsion," by Joseph Marin, Yoh-Han Pao, and George Cuff, Pennsylvania State College, also brought forth a very considerable amount of discussion. In an abstract the authors stated:

"In this investigation, creep-time relations in tension, compression, bending, and torsion were obtained for Lucite and Plexiglas. For each type of stress the influence of the stress and time on the creep deformations and creep rates were determined. Various interpretations of the test data were made. It was found that there was a linear relation between the minimum constant creep rates and the stress when represented on a log-log plot. The creep deformations in tension and compression were expressed in terms of the stress and the time by an equation which considered the initial creep strain.

"A theory was developed for predicting the creep deflection and creep rate in bending, using the creep constants in tension and compression. Good agreement was found between experimental and theoretical results."

The final paper on the program was the annual literature review paper on plastics entitled "Selected Plastics Literature References for the Mechanical Engineer—July, 1949—June, 1950," and was presented by Henry M. Richardson, DeBell & Richardson. New materials, properties of plastics, textile fibers and finishes, paper laminates and reinforced plastics, protective coatings, coating and calendering equipment, plastic molds and molding, vinyl films and sheet, injection molding, extrusion, and plastic material uses, were the subjects on which the selected literature references were given.

Executive and General Committee Meeting

The meeting of the executive committee and general committees of the Division was in the form of a luncheon on November 30 and was presided over by the secretary, Mr. Keen, in the absence of the chairman, Mr. Warner.

T. R. Olive, of the professional divisions committee, was present and explained that there was a vacancy as an associate on this committee and requested that the names of two members of the Rubber & Plastics Division be provided by January 1, 1951, from which one would be chosen to fill this vacancy.

New officers of the Division for 1951 will be chairman, Mr. Keen, and secretary, G. W. Neely, Richardson Co. Gordon B. Thayer, Dow Chemical Co., was elected to the executive committee. New members of the general committee will be Lloyd E. Muller, Buick Division, General Motors Corp., and Harold W. Mohrman, Monsanto Chemical Co.

It was decided that the Division would participate in the 1951 semi-annual meeting in Toronto, Ont., Canada, scheduled for June 18 to 22, with two technical sessions. Two papers on rubber and one on plastics from Canada and the same number and type from the United States were considered desirable for this meeting. M. E. Lerner, *Rubber Age*, was appointed the reporting representative for this meeting.

The Division plans to hold three technical sessions at the 1951 annual meeting in Atlantic City, N. J., November 25-30. One of these sessions will probably be a symposium on rubber-plastic blends.

Chairman of other committees of the Division will be: rubber papers, E. N. Cunningham, Enjay Co.; plastic papers, G. M. Kline, National Bureau of Standards; and publicity, R. G. Seaman, India RUBBER WORLD. Mr. Riesing resigned as secretary of the rubber research committee and no new chairman has been appointed as yet. Mr. Richardson was appointed chairman of the plastics research committee.

By-laws for the Division, as prepared by A. G. Gifford, Lord Mfg., were reviewed, and some suggested changes recommended.

Rhode Island Group Elects

THE fall meeting of the Rhode Island Rubber Club was held on November 16 at the Metacomet Golf Club, East Providence, R. I., with some 147 members and guests attending. The after-dinner speaker was E. C. Crocker, General Latex & Chemical Corp., who discussed the "Manufacture of Foam Rubber." Mr. Crocker's talk was similar to those which he presented before recent meetings of the New York, Quebec, and Chicago Rubber groups.[1]

Election of officers for the coming year was held at the meeting, with the following results: chairman, Frederick V. Newman, Respro, Inc.; vice chairman, C. Leigh Kingsford, Davol Rubber Co.; and secretary-treasurer, Roy G. Volkman, United States Rubber Co. Newly elected directors of the Club are Raymond Szulik, Acushnet Process Co., and Gilbert E. Enser, Collyer Insulated Wire Co. Other directors are U. J. H. Malo, Crescent Co.; Harry Ebert, Firestone Rubber & Latex Products Co.; F. W. Burger, Kleistone Rubber Co.; and W. K. Priestly, U. S. Rubber.

[1] For abstract, see our June, 1950, issue, p. 315.

Los Angeles Group Activities

THE Los Angeles Rubber Group, Inc., held a regular monthly meeting on November 8 at the Hotel Mayfair, Los Angeles, Calif. Some 60 members and guests were present at the afternoon technical session; while 100 attended the evening dinner meeting. Two talks were given in the afternoon: "How to Make Money with Calcium Carbonates," Victor H. Vodra, Wyandotte Chemicals Corp.; and "New Developments in Silicone Rubber," J. W. Raynolds, General Electric Co. Mr. Vodra's talk was similar to that which he gave before the October 26 meeting of the Northern California Rubber Group.[1]

Mr. Raynolds reviewed the history of silicone rubbers, discussed the improvement over initial types by the present silicone rubbers, and described and illustrated typical applications in the electrical, automotive, aircraft, electrical appliance, medical and laboratory equipment, and household fields. General Electric is now introducing a new silicone rubber, #81275, that, when properly compounded, will yield an excellent paste for spreading on glass cloth and other surfaces. The speaker also predicted that G-E will release a new silicone rubber within a few months that can be compounded by rubber fabricators to meet requirements. This new polymer can be handled very much like natural rubber, is easy to mill, can be readily combined with pigments, and can be extruded, molded, and calendered on standard equipment.

After-dinner speaker at the evening meeting was Eugene Biscailuz, Sheriff of Los Angeles County, whose topic was "Yesterday, Today, and Tomorrow in Law Enforcement." Color films of the Group's summer outing were shown with a commentary by L. E. Budnick, Ohio Rubber Co. of California, and reports were presented by the following committee chairmen: current events, Bert Biheller, H. Muehlstein & Co.; nominating, Charles Churchill, Sterling Rubber Products Co.; yearbook, Charles Kuhn, Master Processing Corp.; educational, Charles Towers, Shell Oil Co.; golf, Bob Bowen, Xylos Rubber Co.; Christmas party, R. L. Short, Kirkhill Rubber Co.; and A. C. S. Rubber Division, Ray Bitter, B. F. Goodrich Chemical Co.

The meeting closed with a drawing for door prizes won by Ray McAdams, Los Angeles Standard Rubber Co.; Mr. Biheller; Mr. Budnick; Mike Rockowicz, United States Rubber Co.; F. C. Johnston, Caram Mfg. Co.; A. R. Hromatka, Group photographer; Charles Sickles, Master Processing Corp.; and Murray Nixon, Goodyear Tire & Rubber Co.

Golf Outing

Some 45 members and guests of the Group, the largest attendance of the year for golf—participated in an outing on November 3 at the Wilshire Country Club. As a result of the play, prizes were won by the following: blind bogey, Garvin Drew, A. Schrader's Son Division, Scovill Mfg. Co.; low net, Dean Owens, Rohm & Haas Co.; low gross, Miles Reinke, Reinke & Amende, Inc.; best tee shot, N. Tinkham; longest putt, P. Whitman; fewest putts, Al Pickard, Braun Corp.; longest drive, Bill Michalak, Plastic & Rubber Products Co.; and consolation prize, Al Federico, C. P. Hall Co. of California.

Christmas Party

The Group's annual Christmas party took place on December 8 at the Los Angeles Breakfast Club. Four hundred members, guests, and their wives attended the affair, acclaimed the most successful in the history of the Group. Upon arrival each lady was presented with a silk scarf of her own selection from a large assortment of scarves in different designs and colors arranged for by Bernard Del Guerra, Los Angeles Standard Rubber.

After dinner, the retiring chairman, Elliott McLaughlin, H. M. Royal, Inc., passed the gavel of office to the new 1951 chairman, R. D. Abbott, R. D. Abbott, Inc. The other new officers were then introduced, as follows: associate chairman, Mr. Short; vice chairman, D. C. Maddy, Harwick Standard Chemical Co.; secretary, Mr. Johnston; treasurer, Carl S. Hoglund, Goodyear; and new directors, Mr. Bitter; W. J. Haney, Kirkhill; and D. M. Sheppard, Goodyear.

Mr. Abbott made a brief speech of acceptance and presented Mr. McLaughlin with a gift from the directors of a set of three matched golf clubs. A drawing for 13 door prizes to the ladies was handled by Mr. Del Guerra, and the party concluded with an evening of dancing.

[1]For abstract, see our Dec., 1950, issue p. 331.

APS Meets

THE Division of High-Polymer Physics of the American Physical Society held its fall meeting on November 24-25 at the University of Chicago, in conjunction with the regular Society meeting. In addition to the annual business meeting, the Division held technical sessions on the afternoon of November 24 and the morning and afternoon of November 25.

W. L. Davidson, B. F. Goodrich Research Center, presided over the November 24 afternoon session, at which the following nine papers were presented: "High Polymer Model Including Van der Waals Forces," Eugene Guth, University of Notre Dame, and H. M. James, Purdue University; "Statistical Theory of Large Deformations of Rubber-Like Materials," Ming Chen Yu and Mr. Guth, both of Notre Dame; "Visco-Elasticity of Rubber," R. B. Blizard, Massachusetts Institute of Technology; "A Study of Crystallite Sizes in Polymers by a Light Scattering Method," F. Bueche and P. Debye, Cornell University; "Stress-Temperature Studies of the Second-Order Transition in Rubbers," R. S. Witte and R. L. Anthony, Notre Dame; "Study of High Polymers by Nuclear Magnetic Induction," B. A. Mrowca and L. V. Holroyd, Notre Dame; "Velocity and Attenuation of Sound in Plexiglas," J. Gaffney and A. A. Petrauskas, Notre Dame; "Visco-Elastic and Flow Properties of Polyisobutylene," Herbert Leaderman and R. G. Smith, National Bureau of Standards; and "Relation of Tensile Strength to Brittle Point in Plasticized Polymers," R. F. Boyer, Dow Chemical Co.

The November 25 morning session, presided over by J. D. Ferry, University of Wisconsin, took the form of a symposium on "Solidification and Crystallization in Polymers," with four speakers participating. These talks were: "Introductory Remarks on Polymerization," Mr. Ferry; "Formation of Solids by Vitrification," J. R. Van Wazer, Monsanto Chemical Co.; "Experimental Methods for Determining the Extent of Crystallization in Polymers," I. Fankuchen and H. Mark, Polytechnic Institute of Brooklyn; and "Effect of Polycrystalline Texture on Properties of Crystalline Polymers: Role of Nucleation in the Crystallization Process," Turner Alfrey, Jr., Dow.

Six papers were presented before the final session on the afternoon of November 25, presided over by Mr. Anthony. The papers were: "Mechanical Properties of Substances of High Molecular Weight. IX. Non-Newtonian Flow and Stress Relaxation in Concentrated Polyisobutylene and Polystyrene Solutions," Mr. Ferry and W. W. Evans, both of Wisconsin U.; "Mechanical Properties of Substances of High Molecular Weight. X. The Relaxation Distribution Function in Polyisobutylene and Its Solutions," Mr. Ferry, E. R. Fitzgerald, M. F. Johnson, and L. D. Grandine, Jr., all of Wisconsin U.; "Precipitation of Polymers from Solution: The Role of Molecular Weights in the Kinetic Process," D. R. Morey, Eastman Kodak Co.; "Sedimentation Equilibrium in Concentrated High-Polymer Solutions," M. Wales, Wisconsin U.; "Electrical Properties of Some Carbon Black-Oil Suspensions," M. J. Forster and J. D. Mead, Notre Dame; and "Quantum-Mechanical Resonance between a Pair of Oscillator Sets Which Are Out of Tune," H. Jehle, University of Nebraska.

High-Polymer Papers Wanted

The Division of High-Polymer Physics of the American Physical Society will hold a special meeting in conjunction with the Society on April 26-28, in Washington, D. C., as part of the celebration of the fiftieth anniversary of the National Bureau of Standards. A committee headed by Lawrence A. Wood, of the Bureau, has been set up to organize the program, and suggestions as to the program should be addressed to Dr. Wood at the Bureau, Washington 25, D. C. Potential authors of papers for presentation at this meeting are advised that the time allowed for oral presentation of a contributed paper is 10 minutes at most. Abstracts in duplicate are to be sent to the Division secretary, W. James Lyons, Firestone Research Laboratory, Akron 14, O., not later than February 21. Abstracts should not exceed 200 words in length.

On Neoprene Applications

A MOTION picture, "Neoprene, the Versatile Chemical Rubber," and a talk on "Applications for Neoprene," by S. W. McCune, E. I. du Pont de Nemours & Co., Inc., highlighted the November 16 dinner-meeting of the Quebec Rubber & Plastics Group, held at the Queen's Hotel, Montreal, P.Q., Canada.

The film covered the manufacture of neoprene, the properties and advantages of the different types of neoprene, and some of their applications. The talk further elaborated on applications outside the field of conventional resilient products. Some of these applications are elasticized cement compositions for ship decking, non-slip flooring for industrial use, and decorative floor covering for terraces and sun decks; a special electrically conductive flooring for uses requiring discharge of static electricity; protective coatings for metals, particularly for maritime use; neoprene coatings for Fiberglas aircraft laminates; and treatment of paper.

Rubber Groups Celebrate Christmas

APPROXIMATELY 475 members and guests of the Detroit Rubber & Plastics Group, Inc., the largest attendance in the history of the Group, attended the annual Christmas party on December 8 at the Detroit Leland Hotel, Detroit, Mich. The program included a cocktail hour, dinner, short business meeting at which the new officers for 1951 were announced, and a formal entertainment program. More than 125 door prizes were distributed by virtue of contributions received from some 115 rubber, plastics, and supplier companies.

The new officers of the Group are: chairman, G. F. Lindner, Minnesota Mining & Mfg. Co.; vice chairman, G. R. Cuthbertson, United States Rubber Co.; treasurer, E. V. Hindle, U. S. Rubber; secretary, G. P. Hollingsworth, Minnesota Mining; assistant treasurer, W. F. Bauer, Brown Rubber Co.; and assistant secretary, H. W. Hoerauf, U. S. Rubber. Newly elected counselors of the Group follow: W. B. Davies, Kaiser-Frazer Corp.; T. W. Halloran, Chemical Products, Inc.; E. J. Kvet, Baldwin Rubber Co., and G. M. Wolf, Sharples Chemicals, Inc.

The following were appointed committee chairmen: program, W. J. Simpson, Chrysler Corp., assisted by E. W. Tillitson, Wayne University; entertainment, H. W. Neale, Pioneer Latex & Chemical Co., assisted by J. B. Ledden, E. I. du Pont de Nemours & Co., Inc.; publicity, R. C. Chilton, Permalastic Products Co., assisted by J. B. Craft, General Tire & Rubber Co.; membership, B. M. Holmes, Ford Motor Co., assisted by H. V. Beckerleg, Fisher Body Corp.; and educational, J. T. O'Reilly, Ford, assisted by V. H. Vodra, Wyandotte Chemicals Corp.

New Officers Also Named

Some 453 members of the Boston Rubber Group attended the annual Christmas party on December 15 at the Somerset Hotel, Boston, Mass. The program included a cocktail hour, dinner, business meeting, entertainment, and a drawing for door prizes. The election of the following new officers for 1951 took place at the business meeting: chairman, Thomas C. Edwards, Acushnet Process Co.; vice chairman, John Andrews, Godfrey L. Cabot, Inc.; secretary-treasurer, Alan W. Bryant, Binney & Smith Co.; permanent historian, Harold P. Fuller; and new directors, W. F. Malcolm, Titanium Pigments Corp., Harry W. Sutton, Boston Woven Hose & Rubber Co., and John A. Williams, Haartz Mason Co.

Chicago Affair Crowded

The largest and most successful Christmas party and ladies' night in the history of the Chicago Rubber Group was held December 15 in the Morrison Hotel, Chicago, Ill. A record attendance of more than 750 members, guests, and their wives was present at the affair, which included a cocktail hour, seven-course turkey dinner, two-hour floor show of night-club acts, and an evening of dancing. Each lady present was given a Harriet Hubbard Ayer Beauty Wallet with the compliments of the Group. Credit for the success of the affair is due the arrangements committee under the chairmanship of M. J. O'Connor, O'Connor & Choate, and including R. L. Campbell, New Jersey Zinc Sales Co.; W. A. Cary, George B. Cary & Son; J. C. Gallagher, Allis Rubber Co; John Groot, Dryden Rubber Division, Sheller Mfg. Corp.; E. H. Grossman, Tumpeer Chemical Co.; L. W. Heide, Acadia Synthetic Products Division, Western Felt Works; and Ralph Schell, Bauer & Black Division, Kendall Co.

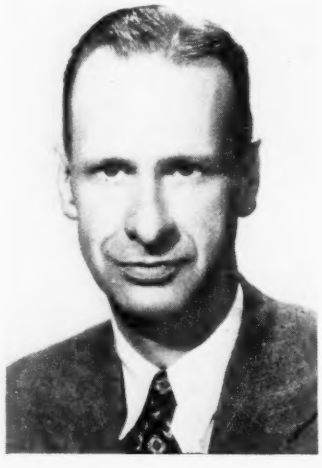
New York Group Party

The annual Christmas party of the New York Rubber Group was held December 15 at the Henry Hudson Hotel, New York, N. Y., with approximately 500 members attending. One of the most successful parties in the history of the Group, the program included a cocktail hour at 5:30 p.m., followed by a dinner at 6:30 p.m. A lively entertainment program of several vaudeville acts came after dinner and was further enlivened by active audience participation. The party concluded with a drawing for 108 door prizes made available by the contributions of many rubber and supplier companies.

Street Replaces Fisher on IRW Advisory Board

JOHN N. STREET, director of chemical laboratories, Firestone Tire & Rubber Co., replaces Harry L. Fisher, division of chemistry and chemical technology, National Research Council, on the Editorial Advisory Board of India RUBBER WORLD for the year 1951. Dr. Fisher, who retired some months ago as director of organic research, U. S. Industrial Chemicals, Inc., resigned from the Advisory Board because of the changes in his associations and work.

Dr. Street received his bachelor's and master's degrees from Syracuse University and his Ph.D. from the University of Wisconsin. His entire industrial career has been with Firestone, where he started as a research chemist in 1926. From 1928 through 1936 he was assistant director of research and during 1935-36 was also attached to the latex division, Firestone Industrial Products Co. Dr. Street was director of research from 1936 through 1944, and from 1944 through 1948 was assistant director of chemical laboratories. From June, 1948, through December of that year he was with the Firestone Plastics Co. and late in 1949 was appointed director of chemical laboratories, the position he now holds.



John N. Street

Dr. Street served on the technical committee on synthetic rubber of the government from 1941 to 1943 and in 1945 was a member of the government's intelligence team that investigated the German synthetic rubber industry. He was, moreover, manager of research and development of the Office of Rubber Reserve, Reconstruction Finance Corp., from October, 1946, through January, 1947.

The new board member belongs to the American Association for the Advancement of Science, American Chemical Society, American Institute of Chemical Engineers, American Institute of Chemists, French Chemical Society, German Chemical Society, London Chemical Society, Society of Chemical Industry, Phi Kappa Psi, Alpha Chi Sigma, Sigma Xi, and Phi Lambda Upsilon. He is a past chairman of the Division of Rubber Chemistry, A. C. S., and the Akron Section, A. C. S.

Celebrates Semicentennial

THE National Bureau of Standards, Washington, D. C., is celebrating its fiftieth anniversary in 1951. To honor the Bureau's semicentennial, many scientific and technical organizations have planned meetings in Washington during the year. Some 26 major meetings have already been announced, including the Division of Rubber Chemistry, A. C. S. on February 28 to March 2, and the Division of High Polymer Physics, A.P.S., on April 26-28. In addition, a number of committee conferences and meetings of local sections of societies will be held at the Bureau, which plans a series of symposia on special topics to be held during the year.

New Indonex Plasticizers

THE regular 600 Series line of Indonex plasticizers, made by Indoil Chemical Co., 910 S. Michigan Ave., Chicago 80, Ill., has found wide application in many types of natural and GR-S rubber compounds, but because of their dark color could not be used in light-colored compounds. A new line of C-Series Indonex plasticizers is now available which has the plasticizing efficiency of the 600 Series, but is much lighter in color and quite color stable.

Properties of the new plasticizers are as follows:

	Indonex Plasticizer		
	C—1	C—2	C—3
Specific gravity	0.954	0.960	0.950
Flash point, °F.	385	410	520
Pour point, F.	—15	—5	120
Saybolt viscosity at 210° F., cps	52	62	119
Color, NPA	5	5-6	Dark Green

Tests were made comparing plasticizer C-2 with a standard coal-tar resinous plasticizer in a natural rubber white tire sidewall compound. Results of tests indicate C-2 to be comparable to the resinous plasticizer in heat and light aging and in staining tests with automobile body lacquers.

Symposium on Fibers

A SYMPOSIUM on fibers featured the December 12 dinner-meeting of the Ontario Rubber Section, C.I.C., held at the Hart House, University of Toronto, Toronto, Ont., Canada. Some 67 members and guests attended the dinner; while 80 were present at the technical meeting which followed. Speakers at the symposium were C. E. Coke, Courtaulds (Canada), Ltd., who discussed "High-Tenacity Viscose Rayon," and J. B. Quig, E. I. du Pont de Nemours & Co., Inc., whose topic was "Nylon, Orlon, and Fiber V."

Dr. Coke began by reviewing the history and methods of rayon manufacture and noted that the output of viscose rayon in Canada during 1950 is approximately 32,000,000 pounds. The first high-tenacity rayon yarn, Tenasco, was produced in 1935, and this material had a yarn strength of about 3.8 grams per denier (as against 2.0 for normal rayon) and an elongation at break of 8-9%. Tenasco was first produced at 275 denier, but the size was later increased to 1100 and then 1650 denier. The most important physical characteristics of high-tenacity rayon are strength, elongation at break, and fatigue resistance. These properties, together with precise control of filament size and uniformity, permit the making of stronger tires with thinner carcasses than can be built with cotton yarn. In addition to tires, high-tenacity rayon is used in such products as hose, V-belts, conveyer and transmission belts, tapes, and others. The speaker noted that cotton would have to drop to a price of about 20¢ a pound in order to recapture some of the market from high-tenacity rayon.

Dr. Quig who reviewed the chemical background of nylon, Orlon, and Fiber V, pointed out that the common properties are high strength, flex life, and elastic recovery; good abrasion resistance; water insensitivity; ability to be heat set; and freedom from attack by molds, fungi, and bacteria. Orlon is characterized by its exceptional outdoor durability and resistance to acids. Fiber V possesses lower growth, greater dimensional stability, and better heat aging properties than nylon. These three fibers permit the production of fabrics and garments which have approximately equal wet and dry strengths, good resistance to soiling, ready launderability, quick drying, and dimensional stability when wet or dry. The high breaking elongation and low initial modulus of nylon have given it many industrial potentialities; while the outdoor durability of Orlon permits its use in many applications. Fiber V with its high modulus is useful for V-belts and high-pressure fire hose.

Pfeifer Group Speaker

THE Washington Rubber Group held its first meeting of the new season on November 28 at the Cosmos Club, Washington, D. C. Speaker of the evening was C. W. Pfeifer, General Electric Co., who spoke on "Applications of Silicone Rubber." During the business session there was a discussion of whether the Group should continue to publish its monthly newsletter, "Capitol Cues," on a permanent basis, and Norman Bekkedahl, National Bureau of Standards, reported on plans for the Rubber Division Spring, 1951, meeting in Washington at which the Group will be host.

Gaskets for High Vacuums

A TALK on "Gaskets in High-Pressure Vacuums," by C. A. Twitchell, Radiation Laboratory, University of California, highlighted the November 16 dinner-meeting of the Northern California Rubber Group. The meeting, preceded by a cocktail hour, was held at the Elks Club, Berkeley, and attended by approximately 38 members and guests.

Mr. Twitchell described the development of the square nitrile-rubber gaskets use in the cyclotron for high vacuum work. From the rubber technician's viewpoint, the gaskets developed are not unusual, being a 30% compressed type in a special groove. The use of nitrile rubber was necessitated by the oil diffusion pumps employed in the vacuum system.

Nominations of officer and executive committee candidates were held with the following results: chairman, Joseph Hollister, Mare Island Naval Rubber Laboratory, Frank McMillan, Shell Development Co., and John Watson, Goodyear Rubber Co.; vice chairman, Neil McIntrye, Oliver Tire & Rubber Co., and Richard Claussen, Pioneer Rubber Mills; secretary, William Moser, Pacific Rubber Co., and Grover Ramsey, Grove Regulator Co.; treasurer, James Sanford, American Rubber Co., and Robert Gray, Pioneer Rubber; and executive committee, Vic Sagues and E. Foubert, both of Sacoma Mfg. Co., George Farwell, Goodyear, John Mason and Milton Lucke, both of Pioneer Rubber, Art Wolff, B. E. Dougherty Sales Co., Fritz Rostler, Golden Bear Oil Co., John McSparren, C. P. Hall Co., Roscoe Burke, Burke Rubber Co., and Arthur Barrett, Mare Island.

CALENDAR

Jan.	18.	Quebec Rubber & Plastics Group. Queen's Hotel, Montreal, P.Q., Canada.
Jan.	18-20.	SPE. National Technical Conference. Hotel Statler, New York, N. Y.
Jan.	21-25.	Nat'l Sporting Goods Assn. Twentieth Annual Convention and Show. Morrison Hotel, Chicago, Ill.
Jan.	26.	Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa. Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Feb.	2.	Akron Rubber Group. Symposium on Quality Control by Statistical Methods. Mayflower Hotel, Akron, O.
Feb.	6.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Feb.	14.	Newark Section, SPE. Military Park Hotel, Newark, N. J. Chicago Section, SPE, and Chicago Chapter, SPI. Builders' Club, Chicago, Ill.
Feb.	16.	Detroit Rubber & Plastics Group, Inc. Detroit-Leland Hotel, Detroit, Mich.
Feb.	21.	New York Section, SPE. Hotel Shelburne, New York, N. Y.
Feb.	23.	Quebec Rubber & Plastics Group. Ladies' Night. Town of Mount Royal Community Hall, Montreal, P.Q., Canada.
Feb. 28-Mar.	2.	Division of Rubber Chemistry, A. C. S., Shoreham Hotel, Washington, D. C.
Mar.	1-31.	Red Cross Annual Appeal.
Mar.	5-9.	ASTM. Spring Meeting and Committee Week. Cincinnati, O.
Mar.	6.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Mar.	9.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Mar.	14.	Newark Section, SPE. Military Park Hotel, Newark, N. J. Chicago Section, SPE, and Midwest Chapter, SPI. Builder's Club, Chicago, Ill.
Mar.	15.	Quebec Rubber & Plastics Group. Queen's Hotel, Montreal, P.Q., Canada.
Mar.	16.	Boston Rubber Group.
Mar.	21.	New York Section, SPE. Hotel Shelburne, New York, N. Y.
Apr.	3.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Apr.	6.	Akron Rubber Group. Mayflower Hotel, Akron, O.
Apr.	11.	Newark Section, SPE. Military Park Hotel, Newark, N. J.

Discuss Human Liberty

A TALK on "Human Liberty" by Gordon Hostetter, Employers Association of Chicago, was the feature of the November 17 dinner-meeting of the Chicago Rubber Group. The meeting was held at the Morrison Hotel and attended by 125 members and guests. Mr. Hostetter described at some length the importance of true Americanism in these difficult times. The speaker also foresaw a trend toward socialism, as exemplified by federal ownership of more than 20% of the land, and an increase of 580% in controls over utilities during the past five years.

Rubber Division to Meet

THE fifty-eighth meeting of the Division of Rubber Chemistry, American Chemical Society, will be held February 28, March 1 and 2, in Washington, D. C., with headquarters at the Shoreham Hotel. The Washington Rubber Group is sponsoring this meeting, and Norman Bekkedahl, National Bureau of Standards, is general chairman in charge.

The 25-Year Club will hold a luncheon meeting on February 28 under the chairmanship of E. R. Bridgwater, E. I. du Pont de Nemours & Co., Inc. Harry L. Fisher, National Research Council, is in charge of local arrangements for this event.

The committee comprising E. B. Babcock, Firestone Tire & Rubber Co., H. A. Winkelmann, Sheller Mfg. Co., and B. R. Silver, New Jersey Zinc Co., appointed at the last meeting in Cleveland, O., to consider ideas for possible expansion of the activities of the Club and to report at the Washington meeting, has asked that members of the Club forward any suggestions they may have to B. R. Silver, 160 Front St., New York 7, N. Y.

The Division banquet will be held on the evening of March 1, and John T. Cox, Jr., is in charge of arrangements for this event.

Abstracts of papers for the Washington meeting are due at the office of the secretary of the Division, C. R. Haynes, Binney & Smith Co., 41 E. 42nd St., New York 17, on January 10.

NEWS of the MONTH

L. D. Spencer to Head NPA Rubber Program; 1950 New Record Year for Rubber Industry

Although an official announcement was not available before Christmas, it was reported that Leland D. Spencer, vice president, Kelly-Springfield Tire Co., would assume full-time direction of the rubber program of the National Production Authority. The NPA issued an amendment to Order M-2 on December 11, ordering consumption of natural rubber, excluding natural rubber latex, held to 40,000 tons in January and to 35,000 tons in February.

Exclusive buying of natural rubber by the government through its General Services Administration with the possibility of five major rubber goods manufacturers and members of the Rubber Trade Association of New York acting as agents was also considered possible by January 1 or shortly thereafter.

The Reconstruction Finance Corp. raised the price of GR-S to 24.5¢ a pound and of Butyl to 20.75¢ a pound on December 7, because of "higher cost of raw materials." Rubber goods manufacturers lost 13% of their December allocations because of lost butadiene production at the Torrance, Calif., plant.

Year-end statements of The Rubber Manufacturers Association, Inc., and leading rubber company executives pointed out that the industry scored all-time production and raw material consumption records in 1950 despite most difficult supply and cost problems.

Industry executives seemed to feel that defense and civilian needs could be taken care of in 1951 without too much difficulty, barring a major war.

Thomas D. Cabot, vice president and treasurer, Godfrey L. Cabot, Inc., was appointed head of a new Committee on International Security Affairs by President Truman on December 21.

Washington Report

By

ARTHUR J. KRAFT

Consumption Controls

NPA issued an amendment to M-2, December 11, ordering consumption of natural rubber, excluding natural rubber latex, held to 40,000 tons in January and to 35,000 tons in February.

Continued in the amended order was the current ceiling of approximately 90,000 tons for new rubber in civilian goods. All provisions, except those relating to natural rubber consumption limitations and a new provision relating to production of camelback were continued unchanged.

The amended order requires that camelback be produced during January and February in the same proportionate rate to new rubber consumed in transportation products as prevailed in the year ending June 30, 1950.

"This will provide material for a major conservation effort in rubber through the recapping of present tires," the agency's press release stated.

An official explained that the new restriction was placed in the order because some recappers have complained of inability to obtain material. Manufacturers, he said, have diverted synthetic rubber from use in making camelback to use in new tires. The amendment is aimed at restoring the *status quo ante* that prevailed before the tire sale boom got rolling in the Spring of 1950.

The natural rubber consumption ceilings, which include defense as well as civilian usage, represent a continuing reduction from the 52,000 tons permitted in November, the first month of such restrictions, and the 45,000 tons authorized for December.

The order allows for consumption of 6,000 tons of natural latex in each month. This will be reduced to 5,000 tons a month starting in March, NPA said.

The amendment limits each manufacturer in January to 82% of his new rubber base period (plus adjustments) usage. For February, a shorter month, the figure is 80%. It was 84% in November and December. For dry natural rubber, each manufacturer is limited to 51% in January and 43% in February of his base period monthly natural rubber consumption. The figures for November and December were 75% and 63%, respectively.

Restrictions on the prevailing pattern were confined to January and February, as NPA and its Rubber Industry Advisory committee agreed, in meeting December 1, to launch a joint review of a more lasting set of specification controls to be placed in effect possibly on March 1, 1951. Recommended specifications have been submitted to NPA for tires and tubes, mechanical goods, and rubber footwear. NPA's press release on this meeting said that the "fluid world situation" dictated its decision to hold to the present method only through February.

The manufacturers made several proposals at this meeting, looking forward toward adjusting to a protracted period of controls. They recommended that RFC increase its production of "cold rubber" to half its total output of GR-S, or from 200,000 to about 375,000 tons. They also recommended that GR-S latex production be increased to 50,000 tons annually, with half to be "cold rubber" latex.

Present plans of RFC, the manufacturers were informed, almost match the recommended latex program.

The industry committee urged the government to appeal directly to the Atlantic Pact nations, Western Germany, and Japan to adopt similar restrictions on their use of natural rubber as adopted by this country in order to speed accumulation of rubber for the defense stockpile.

Such a request to these Allied nations is being considered by government agencies, the committee was informed. Later in December came unconfirmed reports that the United States and other producing and consuming nations were exploring the possibility of informal international allocation of natural rubber among Western nations, with the specific aim of reducing shipments to Russia and Communist China.

Spencer NPA Rubber Program Head

Leland D. Spencer, vice president of Kelly-Springfield, will assume full-time direction of the NPA's rubber program, it was disclosed on December 20. The former War Production Board tire official has been promised full authority over the rubber program of the NPA, which includes administration of allocation and priority controls over all types of rubber. The appointment may not be officially announced until the first of the year, it was indicated in the original story in the *New York Journal of Commerce* of December 21.

Spencer, who came up through the ranks as a production man, was the first deputy director of the WPB Rubber Bureau, which succeeded the Office of Rubber Director during the war. Following the war, he was put in charge of Goodyear Tire & Rubber Co.'s plant in Topeka, Kan.

Then followed two years as an assistant to the U. S. High Commissioner for Western Germany, Gen. Lucius Clay. He was appointed to his position as vice president of Kelly-Springfield early in 1950.

Cabot Heads International Security Committee

Thomas D. Cabot, vice president and treasurer of Godfrey L. Cabot, Inc., and a director and former president of the United Fruit Co., was named by President Truman on December 21 to head a new Committee on International Security Affairs.

Mr. Cabot, a newcomer to the Federal Government, will occupy his new post by virtue of his nomination as director for International Security Affairs, a new office to be opened in the State Department.

The committee will consist of representatives of the State, Defense, and Treasury departments, the Economic Cooperation Administration, and the office of W. Averell Harriman, special advisor to the President for the coordination of foreign policy.

The function of the new committee, according to the State Department and the White House, is the "handling of international security matters and military and economic assistance for mutual defense."

According to a memorandum by President Truman, the need of the committee was as follows:

"The tremendous step-up in our foreign and domestic programs for increasing our own national security and that of the other free nations makes it imperative that we carefully examine the organizational arrangements within the United States Government for carrying out these programs."

He said that the "most urgent organizational problem which we now face involves the proper framework in which the questions relating to the North Atlantic Treaty and economic and military assistance programs can be properly coordinated."

The basic decisions to be made, Mr. Truman declared, would settle the depart-

mental relations of the State, Defense, and Treasury departments and the ECA, and the "adjustments which must be made" within each of those units to achieve an "effective and coordinated government-wide effort."

Exclusive Buying—Natural Rubber

The General Services Administration launched a series of discussions with rubber traders and manufacturers of rubber goods December 5 looking toward the assumption by GSA of the role of exclusive purchaser of all natural rubber imported into the United States. At this writing, December 22, discussions were still in progress with a number of details yet to be worked out.

Disclosure that the government would again assume its World War II role came December 1, when GSA Jess Larson so informed members of the rubber industry advisory committee, then meeting with the NPA on the first quarter of 1951 rubber conservation program.

Larson at that time confined his remarks to announcing his intention to take the step. A representative of the Rubber Trade Association of New York attended the meeting by special invitation.

On December 5, representatives of the rubber goods manufacturers recommended that purchasing be handled by the five largest rubber goods manufacturing concerns and members of the RTA. The manufacturers proposed that the three concerns with buying offices in the Far East and two others with agents there act as government buying agents. GSA asked the companies to prepare drafts of agency contracts; whether GSA has agreed to use manufacturer agents is not known.

The dealer representatives in separate discussions with GSA were reported to have suggested that they continue to handle imports, offering all material to the government. Prices at which the rubber would be transferred to government ownership would be negotiated.

GSA has been reported ready to adopt a loose form of exclusive buying, later replacing it with a purchase and distribution system patterned more closely on World War II lines. It also has been reported willing to hold off any program until it had a more or less complete control scheme worked out in detail.

Under the proposals put forward by manufacturers, the New York Commodity Exchange's dealings in rubber would be eliminated, and prices would be fixed by GSA. Manufacturers with their own buying organizations in the Far East are Firestone Tire & Rubber Co., Goodyear, and The B. F. Goodrich Co. Both United States Rubber Co. and General Tire & Rubber Co. have agency agreements in the rubber growing areas.

Larson is understood to have received a "green light" from chairman of the NSRB, W. Stuart Symington, before announcing his intention to restore the government to its role as exclusive buyer. At present GSA, through the Emergency Procurement Section of its Federal Supply Service, purchases rubber only for the Munitions Board's defense stockpile, buying through New York dealers.

For some time Larson has been seriously concerned with high prices for crude natural rubber and in early June wrote to the then chairman of RFC, Harley Hise, suggesting a conference of top level agency officials on the defense rubber program. He also suggested that RFC immediately step up its production of synthetic rubber to depress the natural rubber market. More recently, Symington, the Senate Armed Services Preparedness subcommittee and, last month, a leading liberal Senator, Paul Douglas (Dem., Ill.), expressed strong criticism of high natural rubber prices.

Leland D. Spencer

Synthetic Price Boosts

The RFC announced December 6 that the standard selling prices of GR-S and GR-I synthetic rubbers would be increased to 24.5¢ a pound and 20.75¢ a pound, respectively, effective the following day.

The announcement, made by Chairman W. Elmer Harber, also disclosed a concurrent increase in the carload freight charge to a flat 1¢ a pound, with a proportionate increase on less than carload shipments.

Customary price differentials of 0.75¢ for special-purpose rubber and 1.25¢ for concentrated latex will continue to apply.

The increases in the standard selling price for GR-S and Butyl rubber from 18.5¢ a pound will boost the nation's rubber bill by about $110,000,000 in 1951. RFC plans to produce 750,000 tons of GR-S and 80,000 tons of Butyl rubber next year.

The nearly 4¢ disparity between the new prices for GR-S and Butyl rubber, some company representatives said, may lead to efforts to substitute Butyl for GR-S where possible, and pressure on RFC to increase the production of Butyl.

Harber explained that the increased prices were made necessary by the reactivation of high-cost alcohol butadiene facilities to feed the expanded synthetic rubber program. About one-fourth of next year's GR-S production will use alcohol-butadiene, the cost of rubber made from which is calculated at about 40¢ a pound.

"As a result of having to use higher cost raw materials," Harber explained, "production costs have risen to a point where it is no longer possible to operate the synthetic rubber program on a break-even basis without an increase in the selling price of synthetic rubber."

Lost GR-S Production

The NPA disclosed on December 15, in a brief press announcement, that the government rubber program ran into serious production trouble during the month. Said the agency:

"More than 100 large and medium sized rubber companies will lose 13% of their December allocations of general-purpose synthetic rubber as the result of a temporary production difficulty. . . about ten days' production was lost in a West Coast butadiene plant when valve leaks developed during the plant's reactivation."

NPA instructed the Office of Rubber Reserve to recall outstanding purchase permits "so that purchases equal to the production loss could be held up." The news came as a complete surprise to consumers of GR-S who, with half their monthly allotments already in process, were fearful that the cutback would disrupt production schedules and might force temporary plant shutdowns. The cutback, it is understood, was applied across-the-board to all holding permits for 100,000 pounds or more of GR-S.

Both NPA and ORR confirmed that the production of GR-S lost during the month amounted to about 3,000 tons, roughly 7% of the 43,300 tons allocated to consumers. An additional 2,000 tons, the balance of programmed December production, was to be held for the government inventory, which has been declining steadily in recent months.

There were reports, denied by ORR spokesmen, that butadiene plants at Houston, Tex., Louisville, Ky., and Akron, O., also were short of December targets. The West Coast plant mentioned in NPA's press release is located at Torrance, Calif., a 45,000-ton design capacity butadiene plant, operated by Shell Chemical Corp. on butane supplied by the nearby El Segundo facility, operated by the Standard Oil Company of California.

ORR reported that it foresees no difficulty in meeting its January production target of 51,000 tons of GR-S.

Benzene Supply

The NPA and the petroleum industry agreed last month to make a long-range study of supply and demand for benzene.

NPA announced that it had asked a task force of producers and consumers, members of its benzene industry advisory committee, to launch immediately a study covering prospective supply and demand for the next five years. A meeting was held December 14.

At the same time a committee of the Military Petroleum Advisory Board, a group of petroleum industrialists making mobilization studies for government agencies, turned its attention to surveying ways and means of manufacturing benzene from petroleum.

Bruce K. Brown, deputy administrator of the Petroleum Administration for Defense, told a press conference December 15 that it is now certain that the oil and gas industry is committed to take some part in the benzene expansion program. The industry is reported, generally, to be reluctant to undertake this job, but has agreed at the behest of both PAD and NPA, who have pointed out that needed benzene expansion can most quickly be achieved by the petroleum industry.

The study undertaken by the NPA industry task group will be the basis for determining what heavy financial investments will be needed for constructing new plants or converting existing facilities to make benzene synthetically.

The consensus among NPA's industry advisers is that, even without emergency mobilization conditions, demand for benzene will have doubled by 1955. Demand for 1951 has been estimated by NPA at about 220,000,000 gallons for all requirements. The agency has stated also that most of the 207,000,000 gallons expected to be available next year will be converted into styrene for rubber.

At an earlier meeting, NPA put the

committee on notice that defense requirements will necessitate the development of new sources of benzene. This same note was sounded by the Senate Armed Services Preparedness subcommittee in its November 21 report, when it said that "benzol presents by far the most acute shortage problem" in rubber feedstock supplies. The subcommittee referred to an NPA report asserting that the "possibilities of obtaining benzene from petroleum in less than a year by any one or combination of several processes offers a distinct opportunity for new supplies in a comparatively short period."

NPA's benzene industry advisers urged, at the December 14 meeting, that the government press for agreement with European nations to expedite imports of benzene into this country. It also recommended refining some motor-grade benzene into chemical grades, substituting petroleum products for benzene in some cases, and prompt completion of a Bureau of Mines survey of the amount of additional benzene which can be recovered by improving coke oven extraction. The committee noted that some increase can be expected from coke oven operations in the steel industry's expansion program. Steel industry coke ovens now supplies the great bulk of the benzene available to this country.

French Alcohol

RFC has named Commercial Solvents Corp. as its agent to expedite movement from France to this country of 120,000,000 gallons of ethyl alcohol for the synthetic rubber program, it was announced December 15.

RFC arranged to buy this alochol last October, with deliveries scheduled at approximately 10,000 gallons a month beginning in January. The alcohol is required for butadiene plants at Kobuta, Pa., and Louisville, Ky.

Officials of Commercial Solvents expressed confidence that, with the cooperation of the shipping industry and the French Government, commitments will be met.

Doubts still persist among informed private observers here that full delivery can be made on schedule because of reported inadequate rail and dock loading facilities in France. Both the French Embassy and RFC are confident, however, that delivery will be made as scheduled. RFC recently rejected all offers of alcohol from domestic sources for delivery after January 1.

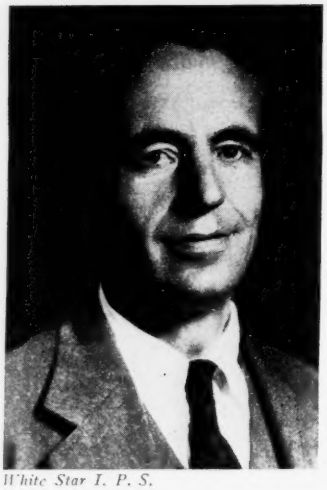
The contract with the French Government calls for a considerably lower priced alcohol than is obtainable from U. S. suppliers.

Phillips Expansion Proposal

Phillips Petroleum Co. approached RFC in late November with a proposal calling for, among other things, construction of additional capacity at the Borger, Tex., copolymer facility to produce 140,000 tons annually of GR-S. Rated capacity at the present plant is 45,000 tons.

The full program outlined by the company calls for an expenditure of $93,000,000. The program also proposes an expansion of capacity at the Borger petroleum butadiene facility, also operated by Phillips for RFC, from the present design capacity of 60,000 tons to a higher, but undisclosed figure; construction of additional facilities for the manufacture of benzene and styrene; and production of an additional 50,000,000 pounds of HAF furnace-type carbon black.

Both company and RFC officials declined comment on the proposal. A Phillips' spokesman said the company has asked the government to underwrite the cost of only part of the program. It is assumed that RFC was asked to undertake the cost of expansions of rubber and butadiene capacity.



White Star I. P. S.

Thomas D. Cabot

Oberfell Appointment

Appointment of G. G. Oberfell as consultant to the board of directors to advise on matters pertaining to the operation of the synthetic rubber program was announced by RFC Chairman Harber, on December 4.

Dr. Oberfell, credited with numerous important developments in synthetic rubber technology, retired last August from a long association with Phillips Petroleum. Until his retirement, he was in charge of the company's research department, which he had organized in 1925. Upon retirement, Dr. Oberfell held the posts of vice president and director of Phillips.

Carbon Black Expansion

The carbon black industry plans to expand production about 20% by 1952, producers informed the NPA at a meeting on December 15. The meeting was called by J. A. Bates, director of NPA's chemical division, to review the supply and demand outlook and the adequacy of production for the expanding defense program.

Industry representatives reported that they anticipate no immediate problem in meeting either defense or other requirements for carbon black. Mr. Bates, summing up the prospective situation, said that the carbon black industry appears in good shape for the first half of 1951.

Producing companies reported plans to expand capacity by 328,000,000 pounds next year from the present installed capacity of 1,529,000,000 pounds. The expansion plans, as reported to NPA, call for an additional 275,000,000 pounds of HAF blacks and 53,000,000 pounds of FEF blacks. Present installed capacity is 238,000,000 pounds for HAF and 183,000,000 pounds for FEF blacks.

Production of all types of carbon black during the first 10 months of this year was 1,123,004,000 pounds, as compared with a total of 1,223,636,000 pounds in all of 1949.

NPA officials, according to the official press release reviewing the meeting, said the supply-demand picture in this material will be watched carefully, and "necessary steps will be taken to assure adequate supplies for defense and other important requirements." In this connection, NPA soon will request the carbon black industry to report its estimated production, sales, and other pertinent data for the year 1951. "All possible assistance" in procuring materials to maintain and expand production was promised by NPA officials. The industry representatives, NPA said, indicated some concern over availability of steel and certain other materials, which the press release did not specify.

Anticipated increased production of carbon black in Europe will lessen the demand for this material from the United States and thus provide a "cushion" in case of a sudden increase in domestic requirements, the industry committee pointed out. An official of the Office of International Trade, which administers export controls, queried the industry members on the advisability or need of export controls to conserve domestic supplies, but the industry group agreed that a ceiling on exports is not required.

Industry representatives said they anticipate higher prices for natural gas as a result of a U. S. Supreme Court decision, handed down December 11, which upheld the right of State governments to establish minimum prices for natural gas at the well-head in the interests of conservations, even when that gas is later transported in interstate commerce. The decision came down in a case involving appeal of a similar state court ruling in Oklahoma. The appellants were Phillips Petroleum and Cities Service Gas Co.

Companies represented at the meeting, as members of NPA's Carbon Black Industry Advisory Committee, were Columbian Carbon Co., Charles Eneu Johnson & Co., Godfrey L. Cabot, Inc., J. M. Huber, Inc, Phillips Chemical Co., Sid Richardson Carbon Co., Thermatomic Carbon Co., United Carbon Co., and Witco Chemical Co.

Rayon Yarn Order

The NPA, on December 2, issued Order M-13 to provide for "equitable distribution of defense orders among producers of high-tenacity rayon yarn." The order took effect as of December 1.

M-13 provides: (1) that producers of high-tenacity rayon yarn need not accept a rated order received less than 30 days prior to the first day of the month in which shipment is requested; (2) that no producer need accept rated orders for any month in excess of 10% of his scheduled production.

NPA officials pointed out that high-tenacity yarn is in sufficient supply, at present, to meet both defense and non-defense requirements. Current production is running at the rate of approximately 300,000,000 pounds annually.

Only six concerns make high-tenacity yarn, used primarily in the manufacture of tires. There are, however, other defense uses, such as in cargo and flare parachutes and airplane fuel cell fabric.

Zinc Oxide Order

The NPA also issued Order M-15, effective January 1, which limits the amount of slab zinc which may be used in the production of French process zinc oxide. In order to comply with this Order, zinc oxide shipments to consumers will be reduced by 20% beginning January 1.

The Order provides that French process zinc oxide covered by "DO" orders can be obtained in addition to the 80% mentioned above if the consumers will file their "DO"

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orders with their suppliers and the supplier has sufficient zinc oxide for this purpose.

FTC Standard Oil Complaint

Five Standard Oil companies and Atlas Supply Co., Newark, N. J., have filed answers with the Federal Trade Commission, generally denying charges of monopolistic practices in the purchase and resale of tires, batteries, and other automobile accessories, the Commision announced on December 12.

The Standard companies asked the Commission to dismiss the complaint, filed July 26,[1] charging that the respondents, in violation of both the Federal Trade Commission Act and the Clayton Antitrust Act, conspired to restrain trade. The complaints also alleged unlawful receipt of brokerage fees and price discriminations. The five Standard companies are the Standard Oil companies of Ohio, New Jersey, Kentucky, Indiana, and California. The complaint alleged that they organized Atlas Supply Co. in 1929 and have since operated it as a medium to exert the influence of their combined purchasing power on sellers of tire, battery and accessory products.

In combination and conspiracy, the Commission had charged, the respondents demanded and received from sellers discriminatory prices, rebates, allowances, and terms and conditions of sale in their individual purchases; replaced sellers who would not accede to these demands; entered into contracts whereby sellers agreed not to undersell to Standard-Atlas competitors; took rebates, in the form of stock dividends, on purchases made through Atlas; and agreed not to compete among themselves in the resale of Atlas TBA items.

The Commission alleged that these practices resulted in foreclosing a large market to competing manufacturers and sellers who refuse to engage in the alleged illegal practices. Since the founding of Atlas Supply, whose common stock is equally divided among the five Standard companies, the latter sales of TBA products bought through Atlas have grown to about 10% of the total U. S. replacement sales, the Commission said.

In answer to this complaint, "the respondents deny virtually every material allegation," according to the Commission's press release of December 12. "They admit," the statement continued, "that the common stock in Atlas is owned in equal amounts of 100,000 shares, each, by the Standard companies, that the common stockholders have the sole voting power, and that the Standard companies receive dividends on their stock from the net profits of Atlas." The answers specifically deny, however, that in the transactions challenged by the complaint, Atlas has acted as agent, representative or intermediary for the Standard companies and is subject to their control. The answers further deny that Atlas is the "instrumentality by, through, or in conjunction with which said 'Standard Oil Companies' exert the influence of their combined purchasing power on their vendors of 'TBA' products. All the answers deny any violation of the law and ask dismissal of the complaints."

Year-End Statements

The RMA in its annual review of the industry's activity first pointed out that the rubber goods manufacturing industry scored all-time production and raw material consumption records in 1950 despite the most difficult supply and cost problems.

Every branch of the industry reported a higher level of activity, as reflected by the increase in rubber consumption to a record of 1,240,000 long tons, up 25% from the 1949 figure and 10% above that of 1947, the previous peak. The industry consumed 711,000 long tons of natural rubber and 529,000 long tons of synthetic rubber.

Passenger-car tire production reached a new peak at 79,000,000 units, as compared with 65,000,000 in 1949 and 78,000,000 in 1947, the previous high. Truck and bus tire production was estimated at 14,150,000 units, against 11,230,000 units in 1949 and 17,750,000 units in 1947, the peak.

The Association emphasized that these records were achieved in face of extremely difficult problems in management and administration. The industry in 1950 was confronted with a diminishing natural rubber supply coupled with a most chaotic cost fluctuation.

[1] See our Sept., 1950, issue, page 695.

FLASH . . . . . .

Natural Rubber Buying and Selling Taken over by Government

The NPA announced on December 28 that effective December 29, 1950, the General Services Administration would become the exclusive buyer and seller of natural rubber imported into the United States. All new contracts for the importation of natural rubber were prohibited effective December 29. Private importation required by contracts made through December 28 will be permitted, after registration with the GSA, unless that agency disapproves them.

After meeting stockpile requirements GSA will resell rubber to private consumers on the basis of allocations set by NPA. All rubber consumers will be asked to submit a detailed list of their requirements showing tonnage, types or grades, and ports of entry as far in advance as possible "to assist GSA in arranging the most economic methods of importation."

Neither GSA nor NPA disclosed details of its purchasing and distribution system or explained how it will price rubber it resells to consumers. GSA will make available from its stockpile 43,000 tons of dry natural rubber for industry use in the first quarter plus additional tonnages purchased in December for delivery in January and March.

Manufacturers of rubber goods can pick up the stockpile rubber by dealing directly with GSA or through a dealer who will make arrangements with GSA. The original manufacturer purchase order must be filed with GSA. The papers do not have to flow through NPA, the allocation agency.

Buying will be handled, it has been reported unofficially, by the five largest rubber goods manufacturers, who have buying agents or offices in the Far East, and by rubber traders in this country, all acting as agents for GSA.

The order dealing with natural rubber buying and selling by the government is Amendment 2, NPA Order M-2, Part 25 Rubber.

Natural rubber cost had moved within a narrow range since 1940, but in the early Spring of 1950 world demand and speculation of a violent nature increased costs to a high of 91¢ a pound by mid-autumn. By mid-December natural rubber costs ranged from 60 to 75¢ a pound. The cost of this raw material remains a real problem when it is considered that a rise of only 1¢ adds $13½ million to the nation's rubber bill on the basis of consumption at the rate of 600,000 long tons of natural rubber a year.

Two principal factors in the supply picture were the unbelievably high consumption requirements in natural rubber both in this country and throughout the world coupled with the impact of the government's accelerated purchases for the security stockpile. The sole helpful influence was the increasing production of American-made synthetic rubber, though it must be noted that at no time in the past seven months was the government able to meet all demands for either general-purpose synthetic or Butyl rubber. Of the 529,000 tons of synthetic consumed in the past year, use was distributed as follows: GR-S, 408,000 long tons; Butyl, 65,000 long tons; neoprene, 42,000 long tons; and, nitrile types, 14,000 long tons.

Where synthetic rubber consumption was down to 33,966 long tons in January, it had soared to 52,000 tons a month in December. Its use will go higher in 1951 as more synthetic plants come into operation by reason of security limitations imposed by the government on natural rubber consumption to speed stockpile accumulation of this critical raw material.

Facing up to the acute natural rubber supply problem and increasingly formidable political developments in Far Eastern rubber producing countries, the rubber goods manufacturing industry moved in April to encourage the government to increase synthetic rubber production in the United States. Recommendations were placed before the RFC, the Senate Armed Services Committee, the NSRB, and the Munitions Board between April and July 6. By September the government had moved to reactivate all of the standby synthetic rubber and feedstock plants. Full impact of the new synthetic production will not be felt, however, until early 1951.

The plainly apparent need of more synthetic rubber also foreshadowed the growing need, after the outbreak of the Korean war, of measures to conserve scarce natural rubber. Thus the rubber industry—the only industry in America never fully decontrolled since World War II—became on September 1 the first to feel the tightening of federal restrictions in a new period of national emergency.

Controls both on the use of all new rubber and on the consumption of natural rubber have been increased progressively since that time. But while the permitted February, 1951, use of natural rubber has been slashed to 43% of the industry's adjusted base period, total allowable consumption in January and February will permit the continuance of rubber goods production at approximately the same volume attained in the base period ended June 30, 1950.

Settlement of two issues in the field of collective bargaining stood out in 1950, a year singularly free of strikes and major work stoppages in this industry. In September and October the large companies negotiated wage increases which averaged about 12¢ an hour on a company-wide basis. This increase brought the average hourly earnings of workers in the tire and tube industry, as an example, to a point where they are among the highest paid in all manufacturing industries in the United

States. Average hourly earnings in the tire and tube industry were reported by the Bureau of Labor Statistics at $1.84 prior to the increase. The adjustment increases these earnings by at least 12¢ an hour, exclusive of overtime. Pension plans negotiated late in 1949 and in early 1950 also were a factor in increased production costs.

Apart from tires and tubes, the second largest segment of the rubber manufacturing industry is the mechanical goods division. Its production covers more than 30,000 end-products, including such items as V-belts, hose, conveyer belts, foam rubber products, engine mountings, tubing, molded and extruded goods, insulating materials, mats, hard rubber products, gaskets and packing, and many others.

Generally speaking, production increases for the industry from 1949 to 1950 were about 40%. In cut thread, a low tonnage item, but important in the widespread use in women's garments, all types of elastic webbing, and elastic for various wearing apparel, production was up 100% from that of 1949.

In the field of latex foamed rubber—a prewar baby, but a postwar giant—business reflected the boom-year demand. Dollar volume was up 100% from 1949. In mid-December, back orders unrolled for months ahead, reflecting the tremendous public acceptance accorded this revolutionary cushioning material.

Rubber footwear, following two mild winters in the areas of heaviest population, had its second successive decline in waterproof footwear, but the industry recorded a compensating increase in the production of rubber soled canvas shoes.

Rubber flooring production jumped 15% in 1950, from 81,600,000 square feet in the previous year to 93,800,000 square feet.

The coated materials division of the industry will show an increase of approximately 10% in linear yard production over 1949 output. This production includes coated and combined fabrics using natural and synthetic compounds as coating media. Principal end-uses include fabric employed in fitting land, sea, and air transportation equipment, furniture, rainwear and industrial protective garments, bed and crib sheeting for homes and hospitals, shoe and novelty fabrics, unsupported film and coated fabrics for the government. Expectations are that the industry will be called upon to furnish large-volume yardage for military requirements in 1951.

Both rubber sundries and rubber heels and soles also made substantial gains in production over that of the previous year.

U. S. Rubber Statement

Harry E. Humphreys, Jr., president, U. S. Rubber, in a year-end statement said that the rubber industry is well prepared to meet the defense needs of the nation in 1951 and at the same time to keep the civilian economy rolling along in good shape.

The industry has production facilities to turn out 120,000 tons of finished products a month, an increase of 40% over 1941 figures.

How fully these facilities will be used for the production of civilian goods, after defense requirements have been met, will depend on the amount of rubber made available by the government to manufacturers for that purpose, it was said.

Indications are that the industry is going to be restricted in its output of civilian products to a level below that of last year's. Such restriction will reflect the government's stockpiling of natural rubber rather than shortage of the material.

Actually, no rubber shortage is foreseen for the year as a whole—unless natural rubber imports from Asia should be cut off, or the government should fail to expand its production of synthetic rubber as planned, Mr. Humphreys said. There will be a shortage of civilian products in the first quarter because in this period synthetic production unfortunately will not take up the slack caused by the drastic limitation in the use of natural rubber.

Attorney General J. Howard McGrath *(Left)* Swears in J. Ward Keener *(Right)*, B. F. Goodrich Co. Vice President, as One of the Three Industry Members of the Wage Stabilization Board. Looking on Are *(Center L. to R.)* Board Chairman Cyrus S. Ching and Secretary Labor Maurice J. Tobin

In the event of a general war, the rubber industry can convert more quickly than most industries to all-out defense production because the Armed Forces use many of the same rubber products that civilians use, it was said. This point is particularly true of tires, which account for the major part of our production.

Some rubber plants have already been plagued by manpower shortages, and this problem is likely to become worse as inductions into the Armed Forces are stepped up. One of the most serious phases of the manpower problem is the shortage of engineers, chemists, and other technical personnel. The cause of this shortage goes back to World War II, when technical students were transplanted in large numbers from the classroom to the battlefield, with the result that many never completed their training.

Heavy demand is expected to continue in 1951 for tires, footwear and clothing, industrial rubber goods, and other major products of the industry.

Growing demand can be expected for chemicals and plastics. U. S. Rubber plans to increase its production of vinyl resins and plastics, said Mr. Humphreys.

In addition, the company's textile division continues to break all previous production records owing to the strong demand from other divisions of the company, combined with greatly increased outside sales, which now account for a substantial part of the division's business.

Goodrich Statement

John L. Collyer, president, B. F. Goodrich Co., first emphasized that the use of new rubber in 1950 totaled 1,240,000 long tons, a record high and more than 80% more than was used in 1940, in his year-end statement.

After weighing all the factors, including the possibility of a major war, this rubber company executive said 1951 rubber consumption might range anywhere from 1,000,000 to 1,200,000 tons. At any rate, he pointed out, consumption in the coming year should be slightly lower than in 1950, despite higher military requirements.

"We expect to be able to supply all military and actual civilian needs," Collyer declared, "barring, of course, new outbreaks in the natural rubber producing areas, or all-out war."

Although fewer tires will be sold to motorists and new car manufacturers in 1951, increased military requirements are expected partially to offset this reduction. In the year just ended only 2% of the rubber industry's production went to the Armed Forces.

Goodrich has begun production of all types of industrial belting in its new $6,000,000 plant in Akron that will permit the manufacture of wider, longer conveyer belting in single rolls, Collyer stated. The company also has pioneered the use of "cold rubber" with its excellent resistance to abrasion in some of the conveyer and elevator belts it produces.

Increased production of the Goodrich puncture-sealing tubeless tire should enable the company to introduce it nationally before mid-1951, he said. It is now available in 30 states. A completely new mud-snow tire said to stop cars faster than conventional tires on snow and ice and to give better pulling power was introduced in October, 1950.

Price increases during 1950 were made necessary by increased cost of all raw materials, particularly natural rubber.

Goodrich has expended nearly $100,000,000 during the past five years in rehabilitating and modernizing plants or establishing new facilities. With the completion of current projects the expansion will be virtually complete.

B. F. Goodrich Chemical Co. has expanded its operations during 1950 with the construction at Avon Lake, O., of a new applied research laboratory and a vinyl resin plant. It has also acquired the Harmon Color Works, Inc., to continue the production of organic color pigments and dyes which are widely used in the plastics industry. Erection of a new plant for the manufacture of industrial rubber products, costing $2,500,000, will be started shortly near Marion, O.

Another division of B. F. Goodrich—Hood Rubber Co.—produces waterproof and canvas footwear, rubber and asphalt tile flooring, and industrial products. Collyer pointed out that Hood, following two unusually mild winters, is anticipating a normal winter and with it a 30% increase in the sale of protective footwear.

Goodyear Statement

P. W. Litchfield, Goodyear chairman of the board, said in his year-end statement that 1950 had started out with a well-defined threat and wound up with a full-fledged crisis. The year was marked by our general preoccupation with domestic affairs—record-breaking production, progressive inflation of wages, pensions, prices, and debt.

It was not marked by adequate preparation against the growing external dangers, Mr. Litchfield declared.

The "police action" phase of the Korean situation found us ill prepared. The full-scale attack of the Chinese Reds brought us to a state of national emergency and to the first stages of a war economy.

Reference to the record breaking production of tires, tubes, and other rubber products was made by Mr. Litchfield, who declared that indications are that 1951 will find the output of the rubber industry lim-

ited only by the available supplies of base materials. If rubber is in sufficient supply, production is likely to equal on a tonnage basis the record year of 1950.

However, because of the mounting military needs and government controls, it is likely that this total tonnage will be made up of fewer passenger-car tires and more heavy truck and tractor and airplane tires.

A certain amount of civilian sacrifice is implicit in this change, Mr. Litchfield warned, but we should all face this prospect with courage and determination. There can be no such inertia and uncertainty in 1951 as there was in 1950 if we are to survive as a free people, he concluded.

Seiberling Statement

J. P. Seiberling, president, Seiberling Rubber Co., pointed out that many new records were set by the tire manufacturing industry in 1950, which began a year of recovery from disappointing 1949, but is ending up as an all-time "boom" year.

Mention was made of record rubber consumption and tire production; the latter topped the output of any previous year. Manufacturers' shipments of passenger, farm, and truck tires will total more than 103 million units, largely because of the record-breaking output of the automobile industry, it was said. For the year 1950, manufacturers' shipments of replacement tires will reach a total of 58 million units, less than the peak years of 1946 and 1947—but at that time the backed-up demand of five rationed war years was being filled.

How much of a boom we have had and how much a recovery from 1949 can be seen by comparing the 1950 results with those of 1949.

For example: Consumption of rubber was up at least 25% from 1949; total tire shipments were up 29%. Replacement tire shipments, which totaled 44 million units in 1949, increased more than 30% in 1950.

Tire recapping also enjoyed a boom during 1950. Shipments of camelback will total about 200 million pounds for 1950, an increase of about 43% from the 1949 level of 140 million pounds.

Prospects for the rubber industry in 1951, like those of so many other segments of our economy, are linked with the answer to the big question: will there be a full-scale war, Mr. Seiberling said.

Whether or not a total war comes, however, he believes the rubber industry will operate at full capacity during the year, he added. It will be limited only by shortages of materials. Military needs, now taking only a small percentage of industry output, will continue to grow and, if all-out war comes, will literally "take over" our production.

The rubber industry's total output of civilian tires will be slightly lower than in 1950, but truck-tire production records of World War II will almost certainly be broken in 1951, it was said.

Declines in civilian tire production were estimated as down 20% for original equipment passenger-car tires, replacement passenger car production down 10 to 12%, or about 16 to 18% overall. Farm tractor and implement tires will be down about 15% from 1950.

Civilian demand for truck tires will be at least as great as it is now, and possibly higher. Recapping should increase because of limitations on civilian tire output and higher tire prices. An increase in camelback sales of 20 to 25% from 1950 levels is expected.

The net result of the effect of these various factors, according to Mr. Seiberling, will be for military demands to boost the output of the rubber tire industry well above the level of 1950, even though civilian tire production may drop slightly because of restrictions on materials, whether we have a full-scale war or not.

Dayton Rubber Statement

A. L. Freedlander, president of the Dayton Rubber Co., declared that the mobilization of the country on a national emergency basis sets a clear pattern for the rubber industry since it is one of the great essential munitions of war.

The civilian economy that must be maintained—transportation of workers, etc.— is equally essential. Since we have a synthetic rubber industry, however, rubber should not be among the greater problems, as it was during the last war.

How soon the gap between civilian and military demand can be filled so as to keep the rubber goods plants running at reasonable capacity is difficult to estimate, but should be relatively short, Mr. Freedlander said. The major limitation will be the supplies of raw materials and component parts such as rayon, cotton, etc.

Economist Says Industry's Outlook Bright

John Hittinger, partner of Lazard Freres & Co., New York investment house, and one-time Harvard professor, investment advisor to the U. S. Steel & Carnegie Corp. Pension Fund, and a member of the finance committee of the Ford Foundation, stated in the *Akron Beacon Journal* of December 10 that rubber is one of America's foremost growth industries.

He said he felt that any list of the half-dozen top industries with the best long-term outlook must include rubber.

"It is still far from a mature industry, especially because of synthetic rubber," said Hittinger, who added that "the growth possibilities rest in the basic needs for the products it makes to take the 'shock out of living'."

In his belief, rubber's expansion is limited by only two things, the desire of people for more products, and the ability of the men who develop and turn out rubber products to anticipate the needs.

Hittinger was particularly complimentary about the rubber industry's leadership. He feels that, as a whole, it is well managed with the ability to act intelligently.

"While rubber will have its ups and downs, it seems to me that in five or ten years from now, the industry will be in a relatively better position than now in comparison with others," he said.

"Some industries are always losing ground, some are static, but rubber is one that is gaining," he added.

It was pointed out that the development of chemical rubber and rayon had played a vital role in the progress of the rubber industry by stabilizing material costs and greatly reducing inventory risks that were traditional when the industry had to depend solely on natural rubber and cotton.

Plastics Outlook

George C. Miller and C. W. Blount, vice-presidents and general sales managers, respectively, of the thermoplastics and the thermosetting departments, Bakelite Division, Union Carbide & Carbon Corp., reported that advances were made in the past year despite a particularly difficult last-half year. Raw material shortages, increased use of plastics, and mounting military demands were factors contributing to the many difficulties and uncertainties existing in 1950.

It is expected that 1951 will probably follow the pattern of the last half of the previous year. It was pointed out, however, that the increased production facilities to become available about the middle of 1951 should tend to prevent shortages from becoming more acute, provided raw materials can be obtained to operate production facilities at full rate.

Work stoppages in the plants of various chlorine suppliers, according to Mr. Miller, limited the production of vinyl resins, beginning in June and continuing through 1950. Mr. Blount cited slowdowns and strikes in the soft coal mining and steel industries as being the primary reasons for shortages of benzol and natural coal-tar acids needed in the manufacture of phenolic materials.

Both polyethylene and styrene are expected to be in particularly short supply during 1951. Although a great many new uses were developed for polyethylene during the past year, it appears likely that many of them must be deferred because of the increasing military demands for this material. Polyethylene is needed in large quantities as an insulator for military communications wire and cable, radar equipment, packaging, and in artillery shell castings.

The use of vinyl resins for sound records has been increasing, and the demand is rapidly growing for vinyl resin compounds in gasket fields for refrigerators, washing machines, and similar appliances, partly because of the superior properties of the vinyl plastics and partly because of the restrictions on the use of rubber.

The demand for plasticized film and sheeting is expected to be greater in 1951 than in 1950 because of superior utility for a great many upholstering applications as compared to nitrocellulose, rubber, or leather and partly because of high prices and decreasing availability of rubber and leather.

Mr. Miller stated that the plastic industry's production of vinyl resins for 1951 is expected to be in excess of 400,000,000 pounds if raw materials can be obtained for this rate.

Mr. Blount cited the greatly increased production of automobiles, electrical appliances, and home building—all using molded electrical parts—as reasons for the greatly increased demand for phenolic materials in 1950. Many of the parts required for such applications have been molded from phenolic materials for years. It is the growing aggregate of these "hidden parts" plus new applications for phenolics such as television cabinets, as heavy as 40 pounds in a single molded piece, that use very large volumes of phenolics.

Natural Rubber News on Rubber Prices

Natural Rubber News for December, 1950, took issue with statements of the last several months that natural rubber producers were withholding stocks, operating a cartel, and encouraging speculation in order to raise the price of rubber. Supply-demand factors made the market, it was said.

Although the Natural Rubber Bureau and all producers who take a long-term outlook view present price levels as too high in relation to costs of production and the relatively cheap price of GR-S, certain additional *facts* regarding natural rubber's price position with relation to other major commodities contradict the current widespread impression that rubber is a bad boy in the family of commodities, *Natural Rubber News* said. In actual fact, natural

rubber is just four years late in catching up with the procession. Commodity price indices of the U. S. Bureau of Labor Statistics were used to show the relation between the prices of other major commodities and natural rubber during the years 1947, 1948, 1949, first 10 months 1950, and October, 1950, and to demonstrate the above point.

The tremendous October natural rubber production of 180,000 tons broke previous record monthly outputs in July and August. The 10-month total of 1,512,500 tons compares with 1,207,500 in the corresponding period of 1949 and shows that 1950 will set an all-time high production record of really surprising proportions.

If this is "withholding," more of the same medicine will help in the months ahead when stockpiling need is so acute, *Natural Rubber News* concluded.

Other Industry News

In a talk before the tire, battery, and accessory group of the petroleum industry, Mr. Collyer emphasized that our main job, five or ten years to come, is to conduct ourselves so that the American economy will remain virile and dynamic.

"Our economy must be strong enough to support us in these threatening days and capable of carrying forward in the years of peace that will follow any emergency," he said.

"We must today face realistically that our entire American economy will be on a wartime, or preparation-for-war basis, for some time to come. We must maintain effective military strength and yet solve the dislocations and problems that this effort thrusts upon our nation.

"To spend billions for military purposes means that vast amounts of materials, facilities, and manpower will be used in the production of goods that are not available for sale to the people, although they will be working at high rates of income. People may have money to buy more than is available to them in the markets, which inevitably leads to price inflation, and in World War II brought price controls.

"Planning, expenditure and production for defense is now vital to our freedom and to our survival. We must meet this challenge as the nation has met challenges of the past, through the courage, the resourcefulness and the skill of its people. The important thing is to recognize that the challenge is real."

Collyer urged other friendly nations to follow the example of the United States and conserve new rubber for government stockpiles.

Goodyear, despite governmental regulations on the use of rubber, plans no changes in its current expansion program on foamed latex production facilities, it was announced in mid-December.

R. E. Pauley, manager of the company's Airfoam division, said the production of Airfoam will be continued by his company in such quantities as are permitted by governmental regulations and supply of materials, both natural and synthetic.

Barring further cutbacks on use, he said, Goodyear should be able to take care of reasonable needs of furniture makers.

He advised, however, that the future international situation and the nation's efforts to build up a stockpile of liquid and dry rubber could make any forecast mean little or nothing almost overnight.

Prior to the start of the Korean hostilities Goodyear instituted a gigantic expansion program to handle increased demands of both furniture and automotive manufacturers. These units are being completed in anticipation of normal business operations, Pauley said. The very fact that Goodyear has spent several million dollars in expanding its Airfoam facilities is evidence of their desire to meet the increasing requirements of these and other industries, it was said.

The rubber footwear industry had its first real increase in demand in two years following the bad storm which covered most of the country in late November. Retailers disposed of a considerable quantity of rubbers, galoshes, heavy shoes, and similar items during the period of the storm, which in turn put them in the market for stock replenishment from manufacturers of such items.

Also in late November a shortage of steel washers for rubber heel production threatened this branch of the industry with a slowdown. Washer manufacturers, rubber heel manufacturers, and the RMA appealed to the NPA, warning of widespread layoffs in 40 heel and sole factories as well as of supply problems for manufacturers and repair shops.

The NPA replied that no real "hardship case" had been established, and that, besides, the government had no means of channeling even the relatively small amount of steel needed to the washer manufacturers. Two hundred tons of low-carbon cold rolled sheet steel was needed by December 31 to relieve the situation, the RMA said.

Fred A. Lang, general manager, Goodrich shoe products sales division, made the forecast in late November that to satisfy the surging demand for rubber heels and soles in 1951, 412,000,000 rubber heels and 204,000,000 rubber soles will be produced in this country next year for use by shoe manufacturers and the repair trade. Surveys show that 65% of all new shoes have rubber heels, and that 85% of all heels used to make shoe repairs are rubber.

Credit for this amazing growth of the rubber shoe products industry was given to the postwar development of new and improved products which outwear competitive products by as much as four to one.

In its regular monthly report on tire shipments and production, the RMA said that manufacturers' shipments of passenger-car tires during October were up 5.2% to 7,340,146 casings from 6,975,259 casings in September.

Production of passenger-car tires increased in October, rising 10.5% to 7,313,860 units from 6,620,742 units the month before. With production at about the same level as shipments, inventories at 3,483,383 units showed very little change from the end of the previous month.

Shipments of truck and bus tires in October were up 9.4% to 1,368,910 tires from 1,251,055 units in the previous month; while production of truck and bus tires rose to 1,345,287 tires from 1,194,871 in September, an increase of 12.6%. Inventories totaled 898,902 tires, a reduction of 2.9% from the end of the previous month, when 925,699 tires were in stock.

Shipments of automotive tubes fell slightly in October to 7,417,991 units, a decrease of 1.8% from September, when 7,555,892 tubes were shipped. Production rose 12.9% to 7,987,691 units, as compared with 7,073,600 the month before. Inventories were up 4.4% to 6,400,392 from the 6,129,401 on hand September 30.

Labor News

Workers at the Armstrong Rubber Co., West Haven, Conn., went on strike December 8 in a dispute over a wage increase and a desire for certain changes in their working conditions contract with the company. The management-union contract at this plant had expired.

It is understood that, among other things, United Rubber Workers, CIO, local union at this plant was demanding a 25¢-an-hour pay boost. The strike involves between 650 and 700 production workers.

The dispute was not settled by December 21, although federal and state mediators have been trying to keep negotiations going. Settlement after the first of the year is considered a good possibility.

In Canada a general wage increase of 11¢ an hour covering 1,800 members of the URWA local union at the Goodyear Tire & Rubber Co. plant in New Toronto, was announced December 3. The company also offered additional adjustments from 2¢ to 9¢ an hour for 200 employes in the engineering department. The increases are retroactive to November 19.

Other points in the agreement include a 40-hour week with time and a half after eight hours, and for any shift worked between Saturday and Monday mornings. The union also won a union security provision under which all new employes are compelled to pay union dues as a condition of employment.

The company has also agreed to submit the question of pensions to its board of directors, it was said.

Get Management Awards

Four rubber companies are among the 238 firms throughout the United States and Canada which are being awarded "Certificates of Management Excellence" for the year 1950 by the American Institute of Management, New York, N. Y. The four companies are Firestone Tire & Rubber Co., The B. F. Goodrich Co., Goodyear Tire & Rubber Co., and Raybestos-Manhattan, Inc. According to Jackson Martindell, president of the Institute, the awards, which will be given annually hereafter, are based on a continuing study of more than 2,000 leading concerns with regard to corporate policies and procedures. In weighing the merits of each management, credits are given for excellence in 10 separate fields: economic function, corporate structure, health of earnings growth, fairness to stockholders, research and development, directorate analysis, fiscal policies, production efficiency, sales vigor, and executive evaluation.

Snell in Mexico

Foster D. Snell de Mexico, S. de R. L. of Apartado 20.609, Mexico, D. F., has been formed, according to Foster Dee Snell, head of the firm of consulting chemists, Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y. It is expected that the new concern will confine its activities to consulting, development, and engineering problems in Central America, particularly in Mexico. J. Carner and J. Sperling, in charge of the new subsidiary in Mexico, will be available for consultation, but it is anticipated that for the present laboratory and engineering facilities at New York and Bainbridge, N. Y., will suffice.

Dr. Snell has been appointed to the advisory commission in chemical technology of the State University of New York Institute of Applied Arts and Sciences.

EAST

Personnel Promoted

United States Rubber Co., Rockefeller Center, New York 20, N. Y., has appointed F. Dudley Chittenden factory manager of the Marvinol vinyl resin plant at Painesville, O. Dr. Chittenden, who has been with the company since 1926, served 16 years in various capacities connected with chemical research and development, both in the general laboratories and the Providence, R. I., plant. In 1942 he was transferred to the synthetic rubber division, became chief chemist of the Institute, W. Va., synthetic rubber plant in 1943, was named factory manager of the synthetic rubber plant in Naugatuck, Conn., in 1945 and development manager of Naugatuck chemical division in 1947.

Frederick N. Taff has been named plant engineer of the Naugatuck Chemical plant at Naugatuck, where he started in 1935 as a technical assistant. In 1937 he became a foreman in the dispersions department, in 1942 a maintenance supervisor in the synthetic rubber plant at Naugatuck; in 1948, Mr. Taff transferred back to the chemical plant as a mechanical engineer in charge of maintenance.

Harry Wintsch, production superintendent at the Naugatuck Chemical plant, has been advanced to assistant to the production manager of the division. Dr. Wintsch, a veteran of 23 years' experience with U. S. Rubber, started as a research chemist; worked his way up through various technical and supervisory positions; in 1941 became assistant manager for Naugatuck Chemical, Ltd., Ontario, Canada; in 1948 returned to Naugatuck Chemical at Naugatuck as technical superintendent; and in October of the same year was made superintendent of chemical production.

Appointment of three new technical representatives for rubber latices and dispersions and the opening of a new area office in Charlotte, N. C., were announced last month by Albert W. Holmberg, sales manager for latices and dispersions for Naugatuck Chemical.

The new area office has been opened at 611 W. Fifth St., Charlotte, to give more complete service to the states of North and South Carolina, Georgia, Florida, Tennessee, Alabama, and Louisiana. Claude H. Allard has been named technical representative covering these states from the Charlotte office.

Charles L. Howard has been made technical representative for the Akron, O., territory, succeeding Albert J. Marshall, now owner of Ryan Rubber Co., Dallas, Tex.

D. Leete L. Keefer has been appointed technical representative in Connecticut and upper New York State; while Arthur Thomas has been named assistant to the sales manager of latices and dispersions.

G. R. McNear has been elected a director and the managing director of North British Rubber Co., Ltd., Edinburgh, Scotland. He has been assistant to the president of U. S. Rubber, a substantial stockholder in the British company. Mr. McNear has been with the company since 1933 and previous to his appointment as the president's assistant in 1949 held important positions in the manufacturing and sales departments of the tire division.

J. S. Johnson has been appointed assistant to the president of the rubber company, succeeding Mr. McNear. Mr. Johnson has been with U. S. Rubber since 1931 and has been on the general manager's staff in the tire division for several years. During World War II he was loaned to the government to head up the tire division of the War Production Board.

Wilbur E. Combs has been made product manager for the L. H. Gilmer division and will be responsible for sales of V-belts, shock pads, flat transmission belts, and other Gilmer products, with headquarters at the Gilmer plant in Tacony, Philadelphia, Pa. Mr. Combs, formerly assistant manager of U. S. Rubber V-belt sales, joined the company in 1945 as a special representative in the Kansas City branch.

Harold P. Lamb — R. C. Seanor — G. S. Andrus — Norman J. Elder

Goodrich Expanding

The B. F. Goodrich Co., Akron, O., will build a $2,500,000 plant for the manufacture of industrial rubber products on a 120-acre tract near Marion, O. The new plant, which will have more than 125,000 square feet of floor space, will employ about 300 with a yearly payroll in excess of $1,000,000 when in full operation, according to T. G. Graham, Goodrich vice president. Work on the buildings will start immediately.

The sales offices and warehousing facilities of Goodrich's San Francisco district have been expanded into a new location at 1950 Army St. The new site provides more adequate warehousing space and better shipping accommodations and now houses the sales personnel of seven divisions under one roof in modern new offices. The formal opening of the new quarters was marked by a ceremony on December 13 attended by San Francisco business and industry leaders. Company divisions now operating at the new address include replacement tire sales, industrial products, footwear, flooring, sundries, International B. F. Goodrich Co., automotive, aviation and government sales, and the Hood footwear sales division.

Changes in Personnel

Albert M. Fiala has been named manager of government sales in the industrial products sales department. He had been manager of latex foam product sales for the last 10 years. He joined Goodrich in 1915, as a factory employe, was transferred soon afterward to the industrial products sales department, was sales promotion manager of industrial products from 1920 to 1925 and an industrial products salesman for 14 years.

Robert O. Howard, on the advertising staff of the associated tire and battery division, has been recalled to duty as a lieutenant of the U. S. Navy, and is succeeded at Goodrich by Glen Bump, from the staff of the *Circle-News*.

Adamson Advances Four

Four important executive appointments in the engineering division of Adamson-United Co., manufacturer of production equipment for the rubber, plastics, and plywood industries, Akron, O., have been announced. Norman J. Elder has been named manager of the calender division; Harold P. Lamb, manager of project engineering; R. C. Seanor, chief engineer; and G. S. Andrus, senior engineer.

Mr. Elder has been with Adamson-United since April, 1946, following several years with the U. S. Navy.

Mr. Lamb joined the company in 1939 after resigning from the Ohio Rubber Co., Willoughby, O.

Mr. Seanor, as chief engineer, has been with the company since 1946, after 11 years with the E. W. Bliss Rolling Mill division at Salem, O.

Mr. Andrus became affiliated with Adamson-United in 1938, after having served as an instructor in engineering at Goodyear Industrial University, Akron.

Adamson-United is a subsidiary of United Engineering & Foundry Co., Pittsburgh, Pa.

Carr Transferred

Transfer of Van C. Carr, auditor and assistant secretary of Adamson-United to the Youngstown plant of the parent company, United Engineering & Foundry Co., and his replacement at Akron by Mark M. Wolff, of United's New Castle offices, has been announced.

Mr. Carr joined Adamson-United in 1945 as plant auditor and was given additional duties as assistant secretary in 1947.

Mr. Wolff has been with United Engineering since 1940.

J. Calvin Lee has been appointed district sales manager at Cincinnati, O., for the Columbia Chemical division, Pittsburgh Plate Glass Co., Pittsburgh, Pa. He succeeds Martin Low, who has retired. Mr. Lee has been on Columbia's sales staff at Cincinnati since 1937.

In conjunction with the new appointment, the firm anounced that the Cincinnati office has been moved to 3903 Carew Tower from 715 Gwynne Blvd.

John J. Walbeck is the new assistant advertising and merchandising manager for Seiberling Rubber Co., Akron, O. He replaces John H. Fogarty, who resigned. Walbeck will work under J. A. Fouche, manager of advertising and merchandising. Walbeck joined Seiberling in 1946 after four years with the Goodyear Tire & Rubber Co. and has been in charge of the Seiberling dealer identification program.

New Building in Chicago for American Cyanamid

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., will lease the new building being built to the company's requirements at Addison and Kimball Sts., Chicago, Ill. The structure will contain 80,000 square feet of warehouse space on the first floor and 20,000 square feet of air-conditioned offices on the second. Additional land at the site affords an expansion potential should it be required later.

The new building will enable the company to meet the varied requirements of all its divisions for office space, laboratories, blending rooms, warehouse facilities, and loading docks.

Among the units of the company which will use the new facilities are Calco Chemical Division's dyestuffs and pigment departments and Cyanamid's industrial chemicals and plastics and resins divisions.

Foreign Visitors at American Cyanamid

A distinguished group of research specialists from six European countries visited the Stamford, Conn., research laboratories of American Cyanamid Co., on November 10 as part of a general American tour under ECA auspices to observe research laboratory methods of operation. Accompanied by M. T. Barnes and B. J. Johnson of the ECA, the visiting group included R. C. Moreau and Guy Emschwiller, of France; Domenico Maragliano and Alessandro Baroni, of Italy; A. W. van Seters and J. B. LePoole, of The Netherlands; B. A. Tomesen, Norway; H. L. Simonssen, Sweden; Arne Fokdal, Denmark; and J. P. Couney, of the French Embassy.

The visitors were welcomed at the laboratory by E. H. Northey, assistant to the director of research and development, who spoke briefly on the organization of the laboratory and its history of growth. The tour through the laboratories was conducted by Dr. Northey, J. H. Paden, director of the research division, and L. P. Moore, manager of the new product development. Following the tour, W. H. Harding, director of the technical service and development division, spoke on "The Functions of Technical Service and Development," and Dr. Moore discussed "The Functions of a New Product Development Department in the Research Organization."

Sales Reorganized in Canada

American Cyanamid has also announced that as of January 1, 1951, products of its industrial chemicals division and coating resins department of the plastics and resins division, will be distributed throughout Canada by its subsidiary, North American Cyanamid, Ltd. Sales offices for these two units will be located in Montreal, P.Q., (7335 St. Lawrence Blvd.) and in Toronto, Ont. (Royal Bank Bldg.).

North American Cyanamid has for some time distributed products of the following American Cyanamid divisions: Calco Chemical, agricultural chemicals, mineral dressing, plastics and resins, and Lederle Laboratories.

In Montreal, an option has been taken on a proposed site for a building or buildings which would house not only all sales offices and warehouse facilities, but Lederle manufacturing operations as well. The company hopes to have construction finished by the end of 1951.

North American Cyanamid also operates the Welland Chemical Works, Port Robinson, Ont., which was built and operated by Chemical Construction Corp. (a Cyanamid subsidiary) and produced during World War II new war materials for the British and Canadian governments.

The Canadian company also operates a large quarry supplying the limestone used in making cyanamid, and for agricultural and other purposes.

Du Pont Advances Three

The rubber chemicals division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has promoted H. Logan Lawrence, Wm. H. Ayscue, and Samuel W. McCune, III, to the newly created positions of sales supervisors in the Boston, Chicago, and New York district offices. In other reassignments of rubber chemicals personnel, E. Paul Hartsfield was transferred to the Akron office and R. Scotton Griffin to the Boston office as salesmen.

Mr. Lawrence, with du Pont since 1934, started as an industrial engineer, was transferred two years later to the rubber chemicals division as a neoprene applications engineer and a compounder in the rubber laboratory, and for the last three years was export sales manager for rubber chemicals and neoprene.

Mr. Ayscue came to du Pont in 1935, worked on early neoprene applications, and later was engaged in sales work in the Wilmington and the Akron offices.

Mr. McCune, who joined the company in 1940 as a compounder in the rubber laboratory, spent the past five years in the main office as a neoprene applications engineer.

Mr. Hartsfield, whose service also dates back to 1940, has been a technical production supervisor in the manufacture of rubber chemicals and, more recently, a compounder in the rubber laboratory at Deepwater Point, N. J., and in the Akron laboratory.

Mr. Griffin has been with the rubber chemicals division since 1946, was a compounder in the rubber laboratory, and recently acted as a special assistant to O. M. Hayden, rubber chemicals technical sales manager.

Raincoats for Radomes

Preliminary tests indicate that the coating of plastic radomes on jet planes with neoprene will prevent rain erosion. Radomes are made of plastic laminates; layers of fabric are bonded together with a thermosetting resin and house the plane's radar equipment. With a plane flying at 400 miles an hour through a rain, it takes only 1½ minutes for the rain to cut through two or three layers of the laminate at the leading edge. In tests, a neoprene coating of only 0.010-0.012-inch prevented damage to laminates for 10 hours in test flights through rain at 400 miles an hour. In addition to its toughness, neoprene coating is easy to apply by ground crews and can also be sprayed to rebuild worn areas. The coatings have worked out so well that they are now being considered for protection of aluminum leading edges on jet planes in addition to radomes.

Wyandotte Chemicals Corp., Michigan Alkali Division, has moved its Cincinnati office to 825 Dixie Terminal Bldg., Cincinnati 2, O.

General Tire in Israel

The General Tire & Rubber Co. (Israel), Ltd., is a going concern today.

Certificate of incorporation has been granted the newest rubber concern by the State of Israel. The authorized capitalization of the company is one million Israeli pounds. Stock is shared by a combination of American and Israel capital. Besides General Tire, the principal American investors include Sidney Albert, of Akron, the Palestine Economic Corp., of New York, and a group of New Yorkers headed by Isaac Shalom.

General Tire engineers are now in Israel doing the preliminary ground work, and shipment of machinery and other necessary equipment is now being readied. Barring unforeseen delays, the factory should be completed to begin production late in 1951.

The factory will produce tires, tubes, and allied rubber products for distribution in Israel. All production will be under the direction of The General Tire & Rubber Co., and the products will carry the General trade mark.

Lampman Promoted

C. Dean Lampman has been named manager of sales promotion at The General Tire & Rubber Co., Akron, O., to succeed A. Ray Carr, recently made manager of Kraft service and accessory sales. Mr. Lampman started with General in 1933 as a special salesman for Jumbo tires, later worked as a territory salesman, and in 1939 became manager of display merchandising with an office in the Akron plant.

Diesels and Tire Wear

After an extensive study of tire mileage on Diesel powered trucks, J. A. Beckett, manager of General Tire's field service and engineering, states that excessive tire wear on Diesel equipment is the fault of the driver rather than of the tire or truck. Drive wheel tires on a Diesel truck will give just as much mileage as on a gasoline powered truck of comparable horsepower rating if drivers are taught not to abuse the great amount of power available at comparatively low engine speeds with a Diesel. Studies on Diesel engine speeds, horsepower, and torque relations have shown that engine and tire life are shortened appreciably when a driver races the engine in starting or accelerates too much and too quickly before shifting to a higher gear.

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., has made the following appointments following the death of Harry V. Snyder, Manhattan factory manager: factory manager, R. J. Gorecki; assistant factory-manager, W. E. Perkins; director of labor relations, D. J. Fenelon; personnel manager, R. Griffith; manager of cord belt department, J. Freeland; and superintendent of cord belt department, A. P. Schneider. With the company since 1926, Mr. Gorecki was previously assistant factory manager. Mr. Perkins was the former manager of the cord belt department; while Mr. Fenelon was personnel manager. Prior to their promotions, Mr. Griffith was assistant personnel manager; Mr. Freeland was cord belt superintendent, and Mr. Schneider, assistant cord belt superintendent.

General Electric Co., Schenectady 5, N. Y., has elected Ralph J. Cordiner president to succeed Charles E. Wilson, now chairman of the new Defense Mobilization Board for the United States Government. Mr. Cordiner, associated with G-E for 24 years, served as manager of five of the organization's departments during that period and has been executive vice president and a director of the company since 1949.

Mark K. Howlett, of the G-E chemical department, has been appointed silicone sales supervisor, with headquarters at Waterford, N. Y., and will have direct responsibility for selecting, organizing, and directing the silicone field sales organization. Howlett first came to G-E in 1941.

Wooster Rubber Co., Wooster, O., recently concluded a meeting of its domestic and Canadian sales personnel at which President J. R. Caldwell termed 1950 "the best year we've ever had." J. R. S. Conybeare, general sales manager, announced sales increases of the firm's Rubbermaid houseware line amounting to 36.4% through department store outlets and 56.4% through wholesalers. Rubbermaid Kar-Rugs and allied sales showed increases of 19.2%, and the increases combined to give Wooster a sales total 35% greater than in the previous record year of 1949.

The Industrial Tape Corp., subsidiary of Johnson & Johnson, surgical dressings' manufacturer of New Brunswick, N. J., has named J. S. Nicholls, Jr., chairman of the board, and Edwin J. Fitzpatrick president. Mr. Nicholls was president of the corporation for the past six years. He joined the company as executive vice president in 1940, having previously been manager of the filter products division of Johnson & Johnson, of which he is also a director. Mr. Fitzpatrick served as executive vice president and a director of the corporation for the past two years.

Dewey & Almy Chemical Co., Cambridge, Mass., has appointed George W. Blackwood general sales manager. Prior to his appointment to the newly created post Mr. Blackwood was general manager of the company's rubber specialties division; he has been with the firm in various sales capacities since 1937.

Henry L. Gilbert, Jr., Dewey & Almy vice president, and Edwin R. Gilliland, professor of chemical engineering at Massachusetts Institute of Technology, recently were elected to the firm's board of directors.

James Lee Cochrun, executive vice president of Seiberling Rubber Co., Akron, O., retired on December 31 after a 30-year association with F. A. Seiberling which began in 1920 when Cochrun joined the Goodyear Tire & Rubber Co. When Mr. Seiberling left Goodyear to start Seiberling Rubber, Mr. Cochrun went with him. He first served as Detroit branch sales manager, then as Akron branch manager and eastern division sales chief, as assistant sales manager (1930), vice president in charge of sales (1938) and executive vice president (1948). In addition he has been a director of the company since 1941 and president of Seiberling Rubber Export Co.

Mr. Cochrun recently organized Cochrun Industries, Inc., which will act as export agent for several Ohio companies, and after January 1 he will devote full time to the company, with offices in the First National Tower, Akron.

WEST

Johnson Representative

The Johnson Corp., Three Rivers, Mich., manufacturer of steam specialties and boiler room equipment, has appointed The Thermal Industrial Engineering Co., 1932 Cherry St., Colo., as new district representative.

Thermal, with Frank T. Settle, president, will represent Johnson in Colorado and Montana, eastern Wyoming, western Nebraska, western Kansas, and northern New Mexico.

The complete Johnson line includes direct operated solenoid valves; boiler water level controls; instantaneous steam water heaters; compressed air separation devices; and rotary pressure joints, used to admit heating or cooling agents to rolls of calenders, driers, ironers, rubber mills, and similar machines.

Amos Molded Plastics, Edinburg, Ind., has installed a 300-ounce injection molding machine, said to be the largest machine of its type in the world for molding thermoplastics. According to General Manager Dale Amos, the new machine not only opens up entirely new fields of plastics applications and products, but will be able to produce larger moldings with less operating expense per pound while also increasing unit capacity and overall production. While no specific new product has been scheduled yet for production on the new machine, which goes into operation early in January, the possibilities for the machine's heavier capacity and greater projected area of moldings are being studied. Manufactured by Watson-Stillman Co., the giant machine with preplasticizing unit weighs 152,000 pounds. The major unit of the machine is 31 feet long, and the pumping unit extends an additional 11 feet. The machine has a capacity of 300 pounds an hour, a clamping capacity of 1,500 tons, and is operated by a 90-hp. motor.

Caram Mfg. Co., Los Angeles 1, Calif., having acquired 1½ acres and a new building with 12,500 square feet of space at 525 E. Evergreen St., Monrovia, expects to start operations there early this month.

Detroit Rubber Co., 5060 Edwin Ave., Detroit 12, Mich., recently was incorporated by E. J. Post, H. C. Taylor, and H. N. Staff, all formerly in the management of the Paramount Rubber Co. from the time of its establishment in 1938. The new firm is prepared to produce molded rubber products, rubber-to-metal assemblies, tank linings, and plating rack insulation; it will feature natural rubber, neoprene, GR-S, and nitrile- and silicone-type rubbers. According to Secretary-Treasurer Staff, the company booked in its first week enough orders to keep it busy for several weeks.

Arrowhead Rubber Co., Los Angeles, Calif., a division of National Motor Bearing Co., Inc., has promoted H. K. Pohlman from president and general manager of Arrowhead to director of the parent company. Vice President Alvin C. Hewitt succeeds to the presidency and is succeeded, in turn, by Cyrus Wintersea.

Rubber Products, Inc., recently moved to a new plant providing 16,000 square feet of floor space, at 1702 W. 134th St., Los Angeles, Calif.

Crown Rubber Co. has bought the building, part of which it had previously rented, at 333 W. Washington St., Pasadena 3, Calif., and plans immediate expansion to occupy the entire structure.

Baker Castor Oil Co., New York, N. Y., has appointed two new sales agents: for the State of Washington, W. Ronald Benson, Inc., 558 First Ave. S., Seattle 4, Wash., with warehousing facilities at Security Transfer & Storage Co. at the same address; for the State of Oregon, Western Chemical Inc., (Hugh G. Mount), foot of S. W. Gibbs St., Portland 1, Ore., with warehousing facilities at the same address.

Molded Products has moved to its own building at 1884 Sepulveda Blvd., Los Angeles, Calif., thus increasing capacity 50%. The firm, owned by Barton H. Thompson, now makes flexible vinyl products as well as latex sponge goods.

CANADA

To Restrict Rubber Use

Canada will eventually have to follow the lead of the United States in restricting civilian use of rubber, according to government officials in Ottawa. Car and truck tires will be the two civilian products most heavily hit. The government will probably try to cut down on civilian use of rubber without the imposition of direct controls, but there is considerable doubt that such a move will be successful. Voluntary controls within the industry were tried at first in the case of steel and then rejected in favor of a government directed control and priority system. Rubber is in no great shortage in Canada at present, despite fluctuating prices in the world markets.

Dunlop Plant Expands

The new $1,000,000 enlargement of the Dunlop Tire & Rubber Goods Co., Ltd., plant at Toronto, Ont., was opened by Sir Clive Baillieu, chairman of the British parent company, at a ceremony on November 28. The new L-shaped plant, built over and around the existing plant in such a way as not to interfere with capacity operation, is only a beginning in Canada. Judging from the demand for the company's Dunlopillo, even greater expansions can be expected in two years if world conditions permit, Sir Clive said. It is an open secret that the company secured 55 acres of land at Whitby, Ont., some years ago for use as a Dunlopillo plant site. If present expectations are fulfilled, this land will be used for an enormous plant; while the present Toronto plant will be diverted to other uses. The new addition at the Toronto plant provides 43,600 additional square feet of manufacturing space and is a two-story structure of steel and reinforced concrete.

Canada's Future Bright

Given sane government and peace, Canada is in a favored position among nations when it comes to future growth, according to C. C. Thackeray, president of Dominion Rubber Co., Ltd. Mr. Thackeray spoke at a ceremony on November 23 at Montreal when some 200 employes of the company were entertained at the annual 25-Year-Club banquet. In discussing working conditions in Canada, Mr. Thackeray stated that it is necessary to be continually on the alert for new methods and machines since material prosperity has grown with productivity, and increased productivity has been the result of expanding use of power and machines.

Gold service pins for 25 years of service were presented to 20 employes of the company; while five were awarded gold watches in recognition of their 40 years of service.

Not Stocking Crude Rubber

Despite a recommendation from the Canadian Industrial Preparedness Association, the Canadian Government is not stockpiling crude natural rubber, it was learned on November 15. Stocks of crude rubber have now reached one of the lowest levels since the end of World War II. In declining to build up existing stocks as a strategic material, the Canadian Government takes the position that this step is unnecessary because of the large synthetic rubber production at the Polymer Corp. plant at Sarnia, Ont. Polymer's production is enough to make Canada self-sufficient, and the government's policy is based on the belief that the Dominion will be able to exchange synthetic for natural rubber from stocks elsewhere in case of need.

The government also feels that it would be unwise for Canada to seek to purchase natural rubber in a market where other nations are already placing large orders. Such a step would merely drive natural rubber market prices even higher, it is held. The Association has expressed disagreement with this policy and backs the recommendation of its own rubber committee. The Association contends that the total cost of stockpiling natural rubber would be small since the money involved would be a capital expenditure. In the event that an emergency failed to materialize, the stocks could be liquidated with little loss. Despite this recommendation, there appears to be little possibility of a change in the government policy in the immediate future.

Seek Injunction

Twenty-two Canadian rubber companies went to court on October 17 to seek an order restraining Thomas D. MacDonald from submitting to the government a report of an investigation into their operation by the Combines Investigation Commission. The investigation was begun in September, 1947, by F. A. McGregor, then chairman of the Commission, and Mr. MacDonald was appointed on February 23 to continue the probe to determine whether a combine existed in the manufacture, distribution, and sales of rubber and related goods. In filing a writ requesting a restrainer, the rubber firms argued that "Insofar as the investigation is concerned, the defendant is not the commissioner named in the (Combines Investigation) Act and authorized to make a report thereunder."

This plea for a restrainer was rejected on November 27, by the Ontario Supreme Court. Justice W. F. Spence stated in his ruling that it made no difference if the report was completed and presented to the government by someone other than the man who started the investigation "so long as he himself comes to his own decision that a combine exists." Mr. MacDonald will now call the rubber companies before him to show cause why they should not be charged with operating a price-fixing combine detrimental to the Canadian public. This procedure is expected to be quite lengthy, and a final report will then be placed in the hands of the Minister of Justice if the Combines Commission still thinks there is cause against the companies.

NEWS ABOUT PEOPLE

Carroll A. Hochwalt and **Felix N. Williams** have been appointed to the executive committee of Monsanto Chemical Co., St. Louis, Mo. This action increases the committee to six men. Other members are Charles Allen Thomas, chairman, Edgar M. Queeny, William M. Rand, and R. R. Cole.

Dr. Hochwalt is a vice president and a director. His sphere of activity will include the research, development, and patent activities of the company.

Mr. Williams also is vice president and a director. His sphere of activity will include sales, advertising, foreign and specialty products.

Arthur R. Gow has been appointed executive vice president and general manager of The Seamless Rubber Co., New Haven, Conn. Mr. Gow first worked for the Hood Rubber Co. then came to Seamless in 1929. In 1930 he was made production manager and in 1941 vice president and factory manager.

Frank D. Hendrickson, president of the American Hard Rubber Co., New York, N. Y., has accepted the chairmanship of the Rubber Division for the 1950 Fund Appeal for the Travelers Aid Society of New York.

William J. Fergus has been appointed Midwest division manager for Rusco brake linings and clutch facings for Russell Mfg. Co., Middletown, Conn. Formerly assistant to the late C. A. Richards, Fergus originally joined the Rusco organization as service manager in Chicago, Ill., in the year 1925.

Carl Totsch, of the Barberton sales staff of Midwest Rubber Reclaiming Co., has been appointed assistant sales manager of the company, with headquarters at the main office in East St. Louis, Ill.

Murray Tribbett has been appointed chief engineer of the Hydraulic Press division, French Oil Mill Machinery Co., Piqua, O. A graduate of Georgia Tech, he was formerly assistant chief engineer of Hydraulic Press Mfg. Co.

Robert G. Kenly has been appointed general sales manager of The New Jersey Zinc Co. and The New Jersey Zinc Sales Co., 160 Front St., New York 7, N. Y. He succeeds **Ralph M. Neumann,** who retired December 31, because of his health, after 44 years with the company.

Arthur Nolan is now vice president and general manager of Latex & Rubber, Inc., 1075 Hull St., Baltimore 30, Md.

Alvin Fuhrmann, who recently resigned as sales manager of Midwest Rubber Reclaiming Co., has accepted a sales executive position, with the adhesives and coating division of Minnesota Mining & Mfg. Co., Detroit, Mich.

Walter R. Westman, formerly with Atlas Sponge Rubber Co., is now affiliated with National Sponge Cushion Co., 2020 Laura Ave., Huntington Park, Calif.

Denis F. Mulvihill, vice president in charge of production of Texon, Inc., South Hadley Falls, Mass., has assumed control of all Texon sales activities. He succeeds J. Warren Heffner, who recently resigned.

F. T. Shor, formerly with American Wringer Co., Woonsocket, R. I., is now chief chemist at MacClatchie Mfg. Co., 2120 N. Alameda St., Compton, Calif.

Frank Bell has been made staff representative for Hycar American rubbers by B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, O. Mr. Bell, who has been with Hycar since 1944, previously had served as chief chemist for Bolta Co. and chemical sales representative for Barrett Division, Allied Chemical & Dye Corp.

William I. Burt, vice president—manufacturing, Goodrich Chemical, was elected vice president of the American Institute of Chemical Engineers for 1951, at its recent forty-third annual meeting at Columbus, O.

OBITUARY

G. Walter Sanborn

G. WALTER SANBORN, vice president in charge of purchasing and traffic of the United Engineering & Foundry Co., Pittsburgh, Pa., died suddenly on December 15. He had been with United since 1917, when The William Tod Co., for which he had been working since 1902, was merged with it.

Mr. Sanborn attended the Union Classical Institute and Colgate University. He was a member of the Purchasing Association of Pittsburgh and served as its president in 1921. In addition he was a member of the Duquesne Club, the Pittsburgh Association, the Masonic Order, and was recently made an honorary member of the Rotary Club of Pittsburgh.

THE STORY BEHIND THE WORD...

KANGAROO...

When Captain Cook came to Queensland, Australia, in 1770, he was much intrigued by a strange hopping animal. Story has it that he asked a native what the name of this creature was. The native shrugged his shoulders and replied, "I don't understand you." Or as it sounded in his dialect, "Kangaroo". Cook thought this was the animal's name and thus it has been called.

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William B. Bell

THE president of American Cyanamid Co., Rockefeller Center, New York, N. Y., William Brown Bell, died December 20 at Marrakesh, French Morocco, while on a business trip. The 71-year-old executive succumbed to a heart attack.

Born in Stroudsburg, Pa., the deceased was graduated from the Westtown School before attending Haverford College, where he received (1900) an A.B. degree, and Columbia University, where he received (1901) an A.M. degree in political science. In 1903 he was graduated as a lawyer from Columbia. After admittance to the bar he served for a time with the firm of Guthrie, Cravath, Henderson & deGersdorff, in New York. In 1922 he took over the leadership of American Cyanamid.

In addition Mr. Bell was chairman of the Jefferson Chemical Co. and active in other American Cyanamid affiliates, a director of the Guaranty Trust Co. of New York, a former trustee of the Bank of New York, and former member of the advisory board of the Central Hanover Bank & Trust Co., and a member of the board of advisers of the Manufacturers Trust Co.

Mr. Bell also held the Society of the Chemical Industry's medal for distinguished economic service; was a past president and board chairman of the manufacturing Chemists' Association of the United States and of the Chemical Alliance; for many years was a director of the National Association of Manufacturers, a past regional vice president of the association, and honorary vice president of the National Industrial Information Committee. In 1934 he served as chairman of the National Committee for Modification of the Industrial Sections of the SEA.

The well-known executive was also a noted yachtsman and had been secretary of the Larchmont Yacht and a member of the New York Yacht clubs. He was, furthermore, a trustee of the Alfred P. Sloan Foundation and of the Duke Endowment and a trustee of Haverford College.

Funeral services were held December 30 at the Friend's Meeting House, Germantown, Philadelphia, Pa., followed by private interment.

Surviving Mr. Bell are the widow, a daughter, and four grandchildren.

William A. Eden

WILLIAM ANDREW EDEN, former president of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada, and a director of Dominion Rubber, Dominion Textile Co., Ltd., Canadian Car & Foundry Co., Ltd., Crown Trust Co., and the Hudson Bay Insurance Co., died suddenly on December 9 in Knowlton, P.Q.

He was born in Woodstock, Ont., in 1882. Mr. Eden was educated in the public schools of Woodstock and the Collegiate Institute; he was graduated in 1901.

That same year he entered the employ of the Imperial Bank of Canada and remained there until 1907, when he joined the Canadian Rubber Co. of Montreal, Ltd. Two years later he was made paymaster and in 1910 became accountant for the company, which was now called the Canadian Consolidated Rubber Co., Ltd. In 1913 he was made chief accountant, in 1915 secretary, in 1919 vice president, and in 1922 president. The deceased held that post until 1939, during which time the company changed its name to Dominion Rubber Co., Ltd. He retired and became vice chairman of the board and in 1945 retired from that position, but remained a member of the board.

In addition Mr. Eden became president of the Canadian Consolidated Felt Co., Ltd., in 1919. He was also vice president and general manager of the United States Rubber Export Co., Ltd., vice president of the Dominion Textile Co., Ltd., president of Woods Mfg. Co., Ltd., vice president of the Mount Royal Hotel, and in 1941 was named a director of Naugatuck Chemicals, Ltd.

The deceased, a former president of the Rubber Association of Canada and former member of the Dominion legislation committee of the Montreal Board of Trade, also was a 32nd degree Mason and belonged to the Scottish Rite, a member of the St. James, Royal Montreal Golf, and Mattawan Fish and Game clubs, and a governor of the Homeopathic and Montreal General hospitals.

Funeral servics for Mr. Eden were held December 12 in Dominion-Douglas Church, Westmount, P.Q., followed by interment in Mount Royal Cemetery.

Surviving are the widow, three sons, two daughters, and two sisters.

Charles M. White, Jr.

CHARLES M. WHITE, JR., for many years associated with the rubber industry as a rubber broker and in other capacities, died December 6 in Warrenton, Va., his birthplace. He was 62 years old.

After graduation from Randolph-Macon Academy, Mr. White attended George Washington University and was graduated with an A.B. degree in 1910.

He first worked for the Fauquier National Bank in Warrenton before going to Akron, O., in 1912 to work for the Firestone Tire & Rubber Co. After sales instruction he was stationed in Syracuse, N. Y., and two years later was made Detroit pneumatic tire representative to the automobile manufacturers of Michigan. In August, 1913, he was promoted to manager of Firestone's Detroit house. Before becoming sales manager of the Firestone Steel Products Co. in 1918, the deceased had worked for three years as factory representative for the Detroit Steel Products Co. and for two years for Stromberg Motor Devices Co. In 1920 he was transferred to Akron, but in June, 1922, resigned to form his own raw materials brokerage, White & Co., in Akron.

Mr. White was a member of the Portage Country, Akron City, and Fauquier clubs, and Kappa Alpha.

He leaves a daughter.

Harry V. Snyder

THE factory manager of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., Harry V. Snyder, died suddenly December 2 in a Point Pleasant, N. J., hospital. He was 56 years old.

Mr. Snyder had been associated with Manhattan since 1909, when he started in the billing department. As the company expanded, he became the head of other departments, including statistical and estimating, before being made manager of the tubing and sundries departments. For more than 25 years he was manager of Manhattan's roll covering and tank lining departments. In 1942 he became assistant factory manager and in 1944 factory manager. During World War II he was in charge of materials procurement.

John T. McLane

JOHN TAGGART McLANE, co-founder of the Sun Rubber Co., Barberton, O., in 1923, died December 9 at a McKeesport, Pa., hospital, following a short illness. The rubber executive was born in West Point, O., on July 17, 1878.

Mr. McLane, who was also president of the McLane Real Estate Co. of McKeesport and the Fredricksburg Art Pottery Co., Fredricksburg, O., was a member of the Central Presbyterian Church, Rotary, B.P.O.E. No. 136, and F.N.A.M. Lodge No. 375.

Private funeral services were held at the McLane home in Mt. Vernon, Pa. on December 13, followed by burial at the Versailles Cemetery, McKeesport.

Surviving are the widow, two daughters, a sister, three brothers, and two grandsons.

Miss W. E. Fenn

THE directors of Rubber & Technical Press, Ltd., London, England owner of *The Rubber Age and Synthetics*, have announced the death of their editress, Winifred Evelyn Fenn, in September. Born in London, Miss Fenn joined the staff of the periodical more than 25 years ago, soon after it had been started. Her career was unusual in British journalism, for starting as a typist, she worked her way through all departments until in 1942 she was appointed editress; in 1946 she became a member of the board of directors.

United States Rubber Statistics — September, 1950

(All Figures in Long Tons, Dry Weight)

	Production	Imports	Total	Distribution: Consumption	Distribution: Exports	Month-End Stocks
Natural rubber, total	0	56,031	56,031	56,424	879	82,865
Latex, total	0	5,117	5,117	4,857	0	4,544
Rubber and latex, total	0	61,148	61,148	61,281	879	87,409
Synthetic rubber, total	*37,939	1,947	46,407	49,550	629	59,059
	†6,521					
GR-S types	*32,678	1,320	34,768	38,584	127	42,905
	†770					
Butyl	*5,261	627	5,888	6,226	9	7,653
Neoprene	†4,377	0	4,377	3,791	297	5,575
Nitrile types	†1,374	0	1,374	949	196	2,926
Natural rubber and latex, and synthetic rubber, total	44,460	63,095	107,555	110,831	1,508	146,468
Reclaimed rubber, total	29,648	101	29,749	29,250	1,177	33,395
GRAND TOTALS	74,108	63,196	137,304	140,081	2,685	179,863

*Government plant production.
†Private plant production.
SOURCE: Rubber Division, ODC, United States Department of Commerce, Washington, D. C.

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for the first time
a truly wettable
zinc stearate

WITCO DISPERSO ZINC STEARATE

the wettable zinc stearate
which readily disperses in water

With this new Witco product, the rubber industry obtains advantages never before possible. Now you can apply zinc stearate to sheeted and extruded goods by using a dipping tank containing a stearate-water slurry. This method is a more accurate means of controlling film thickness; it reduces processing costs; lessens the amount of material formerly lost in dusting.

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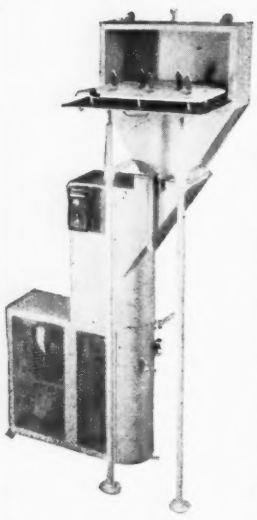

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Here's the cleaner more profitable way to dust extruded rubber goods. Use the Campbell Bagloader and Campbell Soapstoner. Keeps air clean and workers happy. Gets more work done faster and better.

Just place a bag of Soapstone in the top of the Loader, then pierce the bag. Close the lid. No dust gets out and you've loaded the Soapstoner till the bagfull is used.

Compare this *clean* operation to others. Then ask for a quotation on the Bagloader. Write, wire or phone us today.

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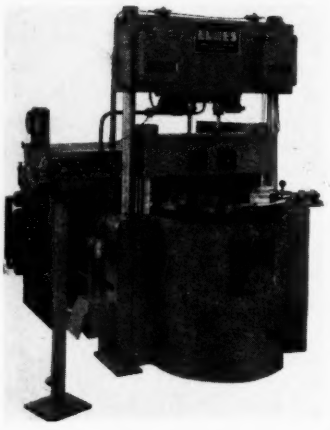


Elmes Transfer Press for Molding Rubber

Rubber Transfer Molding Press

A NEW hydraulic transfer molding press especially designed for the molding of small rubber parts around metal inserts has been announced by Elmes Engineering Division, American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, O. The new press can produce parts at the rate of 20 units per two-minute cycle, which is a substantial increase over previously used methods.

The press is equipped with two transfer rams, each of 20 tons capacity; while the moving down die clamp has a 60-ton capacity. The lower halves of the die are mounted on a rotating three-station table which provides nearly continuous processing of materials by permitting simultaneous loading, curing, and unloading at the three stations.

Pushbutton operated semi-automatic timed cycle controls are provided, with inching features for all movements. The rotating table is mounted on a circular steam plate to maintain die temperature when the dies are out of pressing position. The clamp is provided with a smaller steam plate, and automatic controls are used to maintain constant temperature.

New Extruder Take-Up

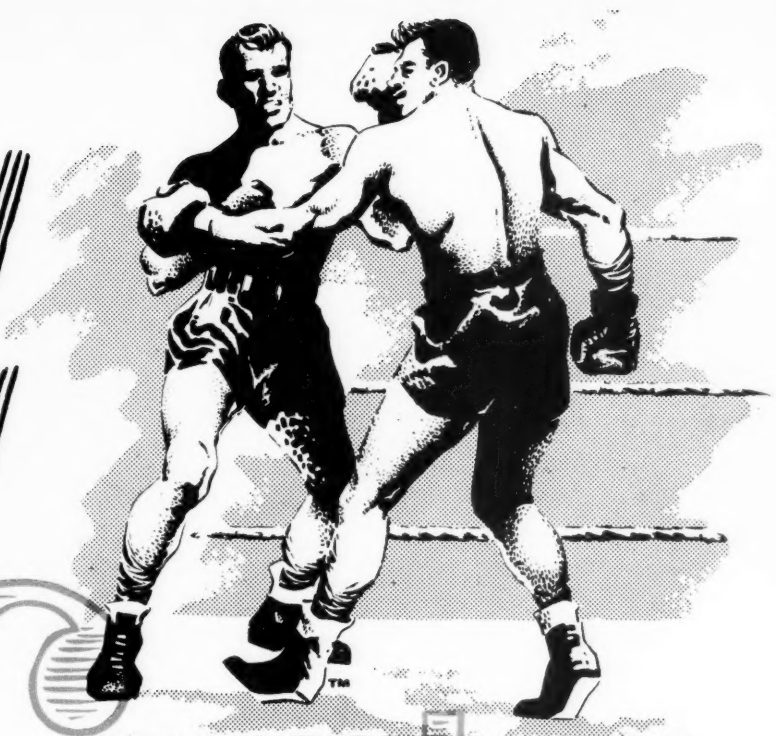
A NEW high-speed, constant tension, dual-reel continuous extrusion take-up unit with integral capstan and tension stand has been announced by Industrial Ovens, Inc., 13825 Triskett Rd., Cleveland 11, O., for use with rubber or plastic covered wire, cord, or cable. The speed range of the take-up is from zero to more than 2,600 feet a minute, with instantaneous acceleration of the empty reel to synchronous wire speed as soon as a cross-

Faster Processing?

SEE PAGE 392

pound for Pound

YOU CAN'T BEAT



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Pound for pound, CRYSTEX contains more insoluble sulphur . . . it's guaranteed to be 85% insoluble in Carbon Bisulphide. When you compare the price of CRYSTEX in relation to this extremely high insoluble sulphur content, you'll find CRYSTEX to be less expensive. In fact, by this per unit comparison, CRYSTEX is the most economical insoluble sulphur on the market.

Let us send a generous testing sample and the very latest technical and use data on CRYSTEX Insoluble Sulphur.

OTHER STAUFFER PRODUCTS

Commercial Rubbermakers' Sulphur, Tire Brand, 99½% Pure

Refined Rubbermakers' Sulphur, Tube Brand

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Carbon Bisulphide

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NEW RUBBER STRIP CUTTER

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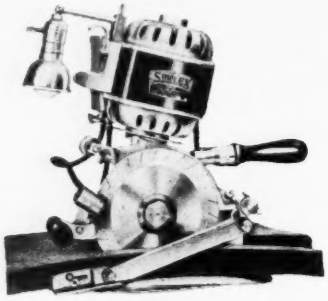
A NEW PORTABLE MACHINE capable of stripping slab rubber up to 2" thick at the rate of 20,000 feet in 8 hours. Any width desired.



SPECIAL FEATURES: micro-adjustment for accurate widths; equipped with water tank which feeds water to slotted knife and into cut; has repulsion induction motor which carries any overloads; automatic sharpener keeps knife sharp; base with rollers for easy handling; cuts within 1/64 inch to 1/100 inch tolerance depending on grades of rubber; cuts slab down to the last shaving; cuts all grades of rubber including pure gum, sponge, etc.; cuts squarely—no rejects.

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Side plate or column presses for compression or transfer or injection molding of rubber and allied synthetics.

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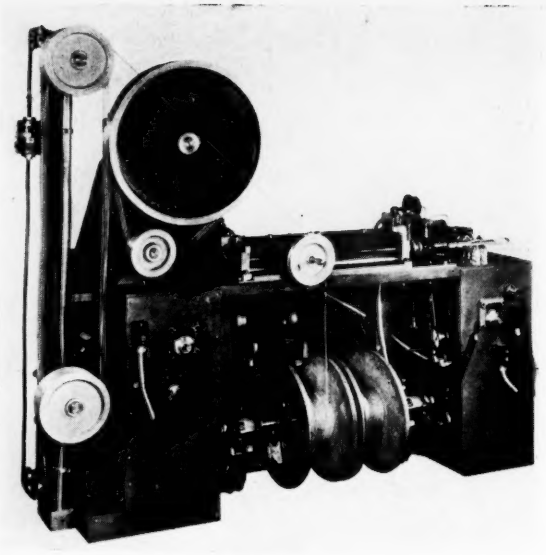

Industrial Oven's New Extrusion Take-Up with Integral Capstan and Tension Stand

over is made. No interruption or slow down in the winding process is necessary to shift from a full to an empty reel.

All reel, capstan, and traverse drives are hydraulic and completely self-contained, with fully enclosed, oil immersed gears. The hydraulically driven traverse provides a 25:1 lay range. The ingenious reel mounting, featuring a demountable shaft and bearing housing assembly carried by a heavy bearing mounting on a lever operated tilting base, permits loaded reels to be deposited gently on the floor upon the reel flanges to minimize damage and distortion. The unit also includes provision for "ends out" winding. The entire unit is furnished as a complete, fully integrated package ready for connection to the power line. It is also available without the capstan or with separate floor mounted capstan and tension stand.

Rubber Industry in Brazil

On the basis of rubber purchases by the Rubber Credit Bank and shipments of uncontrolled types of rubber by Para and Bahia shippers, production of crude rubber in Brazil in the first half of 1950 has been calculated at 12,800 tons, against 14,500 tons for the same period of 1949. Shipments of rubber from producing to consuming centers in Brazil totaled 10,253 tons, against 8,131 tons in the 1949 period, reflecting the increased demand by the local rubber manufacturing industry.

Among the natural gums produced in Brazil in the first half of the current year were 81,877 kilograms of balata, 435,334 kilograms of Massaranduba, and 1,033,114 Sorva gums.

The local rubber goods manufacturing industry has been very busy recently on general rubber goods as well as tires. Manufacturers are attempting to enter new fields. Early in 1950 one firm reportedly installed machinery for covering rubber thread with textile fiber and has begun to make covered thread for use in elastic webbings. Another concern has started to make rubber bathing caps. At the same time it is noted that production of certain lines of mechanical rubber goods appears to be more than adequate, and that sharp competition and lower prices are looked for here.

The local output of tires and tubes, on the other hand, is still insufficient to cover home demand despite the fact that production has for several months been on a three-shift round-the-clock schedule; the number of workers in the tire industry has been increased so that by the end of June it employed about 14,000 out of a total of about 18,500 workers in the rubber industry as a whole. It is understood that plans are afoot aiming at an increase of 33% in production capacity by next summer. Local tire manufacturers too are attempting to follow new developments; there is said to have been some successful experimentation with rayon cord; trials with domestic bead wire, however, have so far not given any encouraging results, it seems.

Boots courtesy of U. S. Rubber Company

extend
the
life of white
rubber
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non-staining

ANTIOXIDANT 2246

No other rubber chemical can equal the performance of ANTIOXIDANT 2246 in extending the life of white and light-colored rubber stocks, with no discoloration resulting.

That's because ANTIOXIDANT 2246 is the most active non-staining, non-discoloring antioxidant ever developed.

Excellent in both natural rubber and GR-S stocks, ANTIOXIDANT 2246 helps retain the original physical properties of rubber, thus extending the service life of rubber products. Write for technical bulletin.

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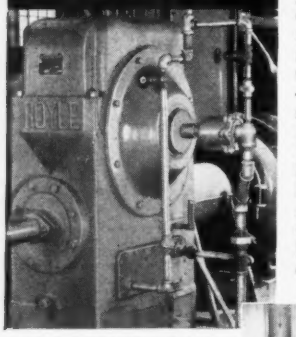
SALES REPRESENTATIVES AND WAREHOUSE STOCKS: Akron Chemical Company, Akron, Ohio • Ernest Jacoby and Company, Boston, Mass. • Herron & Meyer of Chicago, Chicago, Ill. • H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N.J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto

JOHNSON Rotary Pressure JOINTS

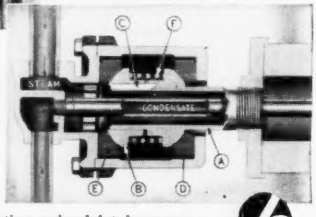
Setting a New Pace in the Rubber Industry



When it comes to admitting heating or cooling agents to rotating rolls or drums, the Johnson Joint completely outmodes the old style stuffing boxes. It saves enough in reduced maintenance alone to pay its own way quickly—it is completely packless, self-lubricating, self-adjusting and even self-aligning. In addition, it can materially benefit over-all production—by ending many causes of machinery shut-down, by its more efficient performance, by facilitating better roll drainage.

Write for fact-filled literature.

Johnson Joint installed on rubber extruder. Photo courtesy of Manhattan Rubber Div., Raybestos-Manhattan, Inc.



Rotating member consists of Nipple (A) and Collar (B), keyed together (C). Seal ring (D) and bearing ring (E) are of self-lubricating carbon graphite. Spring (F) is for initial seating only; joint is pressure sealed in operation.

The JOHNSON CORPORATION, 869 Wood St., Three Rivers, Mich.

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New Goods and Specialties

Plastic Closet Accessories

THE latest contribution to closet glamor is Tafatene, a product made from Firestone Plastic Co.'s Velon vinyl film, which combines the luxurious appearance of fine silk taffeta with the washable and long wearing qualities of plastic. Made by Jayhawk Mfg. Co., New York, N. Y., Tafatene closet accessories are available in a complete line of items, including garment bags, hat boxes, drawer cabinets, storage boxes, and shoe bags. The products are made in soft shades of blue, rose, green, gray, wine, and chartreuse.

Tafatene Closet Accessories Made from Firestone Velon

Koroseal Covered Foam Rubber Cushion for Laboratory Stools

Cushion for Laboratory Stool

A NEW foam rubber cushion to laboratory stools has been announced by Fisher Scientific Co., Pittsburgh 19, Pa. The cushion provides a resilient, nonmatting, "breathing" seat that is more than one inch thick, and greatly relieves the strain of prolonged work at analytical balances or other instruments. The cushion is covered with tough Koroseal that provides a chemically resistant, long wearing surface, and grommets around the Koroseal edge provide air holes through which the sponge rubber breathes.

This new cushion will fit any laboratory stool of 12½-13 inches in diameter, and is securely held on the stool by a tight-fitting self-adjusting band.

"Basic Problems of Plantation Labor." Committee on Work on Plantations, International Labor Organization. Copies available from International Labor Office, Washington Branch, 1825 Jefferson Pl., N.W., Washington 6, D. C. Paper, 6¼ by 9½ inches, 170 pages. Price, $1. This is the report on a survey of plantation labor, including rubber plantations, made by the Committee for discussion at its first session in Bandoeng last year. In addition to general background information on plantations, the report covers recruiting, engagement, and regulation of employes; working conditions; employment of women and children; wages; living conditions; health and social security; educational and training facilities; labor relations; inspection of labor conditions; and conclusions reached on the basis of the survey.

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Multiple Opening
This picture is typical of multiple opening platen type presses of strain plate construction. This particular press is intended for curing rubber molded products but similar presses are used for press polishing and many like applications. The strain plates are preferred for some work because they provide greater rigidity than strain rods and prevent radiation and heat loss from steam-heated platens. A variety of accessories are available for spacing the platens, opening them, and connecting them to the steam supply. Various elevator arrangements can also be supplied for rapid loading and unloading.
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FAR EAST

MALAYA

Report on the Quality and Grading of Natural Rubber

The Rubber Research Institute of Malaya recently issued a report on the proceedings of the international meeting to discuss the quality and grading of natural rubber, held under its auspices in Kuala Lumpur, September 12-14, 1949, and attended by members of various Malayan scientific, planting, and commercial organizations and representatives of institutes for rubber research outside of Malaya. Before the meeting a memorandum had been circulated in which the principal questions suggested for discussion were outlined: appearance and cleanliness of rubber; development of technically certified grades; improvement of the intrinsic properties of rubber; the order in which priority should be given any proposals put forward.

A summary of some of the comments by experts follows:

C. M. Blow and G. Gee, of the BRPRA, urged that the immediate need was to produce a substantial proportion of all natural rubber under such conditions that it can be guaranteed to conform to a reasonable and specified standard of cleanliness, plasticity, and vulcanization characteristics.

G. Martin (London Advisory Committee for Rubber Research—Malaya and Ceylon) stressed the importance of research on technical properties of vulcanized natural rubber as resilience and abrasion and scorch resistance—particularly the relation between tendency to scorch and rate of vulcanization in a rubber-sulfur mix.

The Rubberbond of Indonesia, through J. G. van 't Oever, seemed chiefly in favor of centralized preparation of rubber; uniform packing, coating, and marking of rubber bales were also recommended.

D. W. Hawkins (Dunlop Malayan Estates, Ltd.) considered the improvement in intrinsic properties to be fundamentally the most important problem. In another direction, he expressed himself in favor of packing in small bales.

The report also gives summaries of various technical papers presented:

W. P. Fletcher (BRPRA) spoke on some problems involved in grading and testing natural rubber.[1] He discussed tests for classifying rubber according to the properties of its vulcanizates. Variability tests have hitherto been based on modulus at more than 500%, an unsatisfactory criterion because it evaluates the vulcanizates in a condition which occurs in very few practical applications; a modulus tests at less than 250% extension was preferred. He described a test in which an adaptation of the United States Bureau Standards strain tester is used which can be constructed very cheaply. He rejected a familiar A. C. S. mix and gave reasons for preferring a mix accelerated by MBT/DPG. A test specification must take account of minimum strain attainable and the time of cure giving this value. Modulus at a single cure is not a satisfactory criterion; for specification purposes tolerance limits should be specified for strain at three levels of cure. Fletcher also showed the importance of mixing errors and the dependence of minimum strain estimates on the Mooney viscosity of uncured compound.

C. M. Blow (BRPRA) discussed methods of testing to be adopted to grade crude rubber to technical specifications, proposing testing stations equipped to grade 25 samples of 10 tons each daily and outlining compounding procedure and vulcanization conditions, and describing vulcanizing molds, and limits for standard rubber with respect to dirt content, Mooney viscosity, and percentage strain at 20-, 40-, and 70-minute cures.

The relations between the modulus and the other mechanical properties of rubber vulcanized in the Captax test mixture were taken up by J. W. Dalfsen (Indonesian Institute for Rubber Research). The purpose of the work was to get the maximum amount of information from tensile tests at a single vulcanization period, using the Schopper dynamometer and normal ring pieces. Tensile strength at 700% elongation of a vulcanizate cured for 60 minutes at 127° C. in the A. C. S. (Captax) test mix was selected as the reference observation (TS 700).

Data were obtained of tensile properties at 20, 40, 60, 80, 100 minutes cure at 127° C. for about 100 samples of rubber of various origins and different methods of preparation covering a wide range of variability in curing time and mechanical proper-

[1] See India Rubber World, Sept., 1949, p. 710; Mar., 1950, p. 686; Sept., 1950, p. 685.

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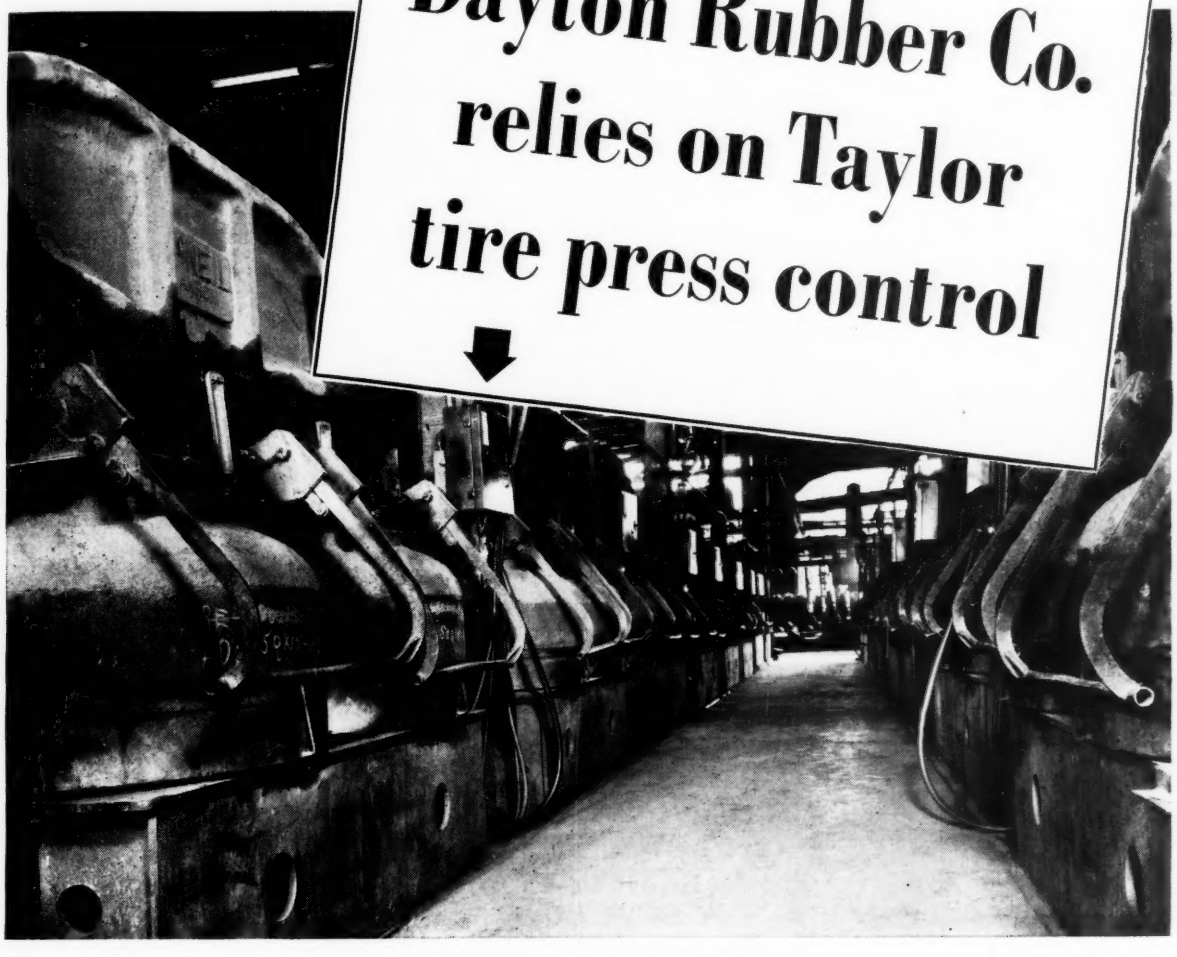

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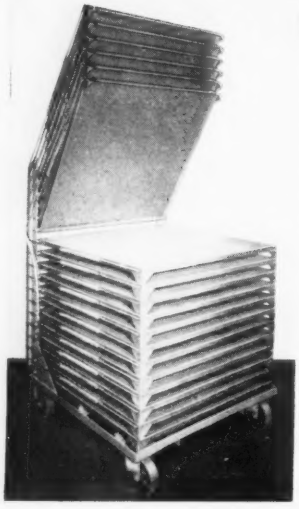

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ties. A high correlation of coefficients was obtained as well as moderate standard deviations, from which it was concluded that TS 700 (60-minute) is indeed characteristic of the properties obtainable after any given curing period. It is therefore possible to judge whether the mechanical properties (in the A. C. S. mix) are normal or inferior. In dubious cases a second vulcanization for a longer period is desirable.

Of the same Institute, W. J. van Essen described a method of rapid determination of the content of dirt in rubber. A sample is masticated with the aid of a plasticizer for five minutes, dissolved in boiling toluene with the aid of copper oleate, and centrifuged in a graduated tube which shows directly the volume of the dirt in the sample.

J. C. de Neef, also of the Indonesian Institute, spoke on identification of rubber coagulated with too much sulfuric acid. Rubber prepared with excess sulfuric at first looks normal, but after 8-12 months it tends to become soft. A suitable rapid test for determining whether an excessive amount of sulfuric acid has been used for coagulation is the heat test for three hours at 104° C. Control sheets prepared for formic acid remain practically unchanged in this test; whereas sheets made with sulfuric acid undergo considerable softening and tend to flow.

Regarding coagulation with sulfuric acid, H. C. Baker and M. W. Philpot (Rubber Research Institute of Malaya) found that rubber coagulated with sulfuric acid vulcanizes slowly, but is not defective in other respects. A supplementary study of smallholders' sheets coagulated with sulfuric acid and with formic acid failed to disclose any gross disparity between the quality of formic and sulfuric acid samples.

Local Rubber Notes

The Malayan Government is considering a substantial increase in the present 5% duty on rubber as a means of paying the costs of the anti-terrorist campaign. All interests involved, however, will be consulted before definite action is taken.

A Malayan Section of the Institution of the Rubber Industry has been formed in Kuala Lumpur as a result of the efforts of R. J. Newton. The new section is under the chairmanship of W. W. Marsh. It is planned to organize courses in rubber and latex technology, but subjects pertaining purely to planting will be excluded.

The economic & political committee of the Singapore Labor Party has stated its views on steps to be taken to improve conditions in Malaya. The committee wants rubber and tin and public utilities in the Malayan Federation to be nationalized; it wants lands redistributed so that no person would own more than five acres; and it wants immediate unification of the Federation and Singapore into a single political entity for economic, cultural, and administrative purposes.

"The Planter," journal of the Incorporated Society of Planters in Malaya, in a recent issue advocates building one or more factories for producing synthetic rubber in England. The journal suggests that part of the profits of European owned estates should be used for establishing a synthetic rubber factory, for its strategic value and also because:

"It is possible that the possession of several such factories at home might be a contributory factor towards deterring a foreign power from launching an attack which would inevitably embroil all the major democratic powers."

INDO-CHINA

With the collaboration of the Institut Français du Caoutchouc, investigations[1] have been initiated at the Rubber Research Institute of Indo-China to determine the possibility of improving the quantity and quality of the output of *Hevea brasiliensis* by the use of oligo-elements. The work is based on the assumption that rubber is formed as the result of a series of condensation, dehydration, and reduction reactions involving the products of the catabolism of glucides. It is suggested that the oligo-elements enter into the composition of the enzymes that take part in these reactions and affect the production of *Hevea* in exploitation, consequently the application of oligo-elements might prove useful in modifying the formation of rubber in the latex vessels.

Among the substances tested were $CuSO_4$, $ZnSO_4$, NaF, and the sodium salt of 2,4-dichlorophenoxyacetic acid (2,4 D). Of these $CuSO_4$ proved the most active, with 2,4 D not far behind. The method of applying these materials was that developed by

[1] *Rev. gén. caoutchouc*, 29, 9, 525; 10, 591; 11, 663 (1950).

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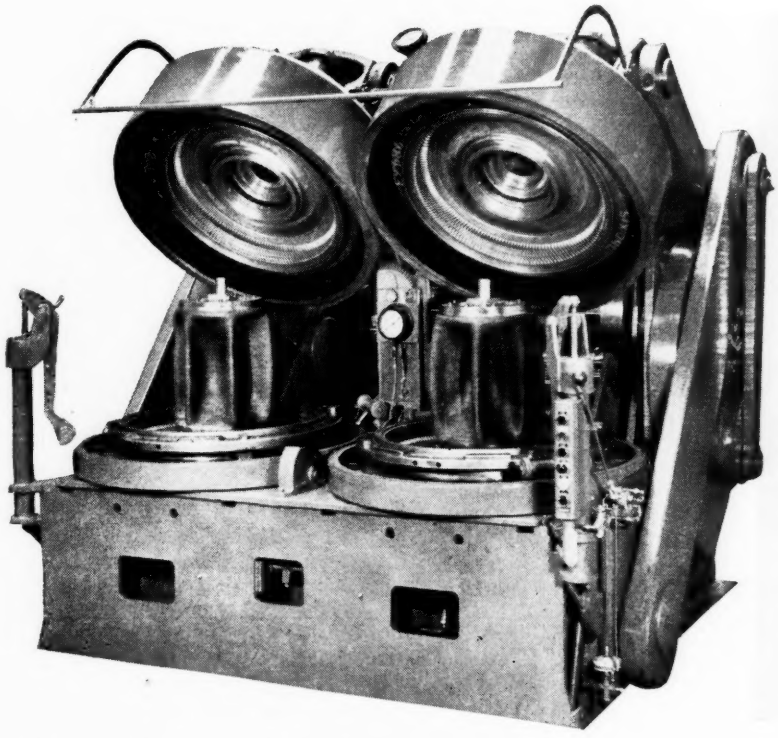

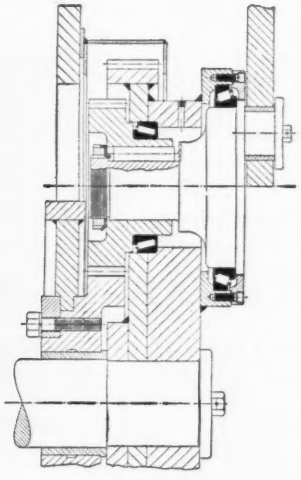

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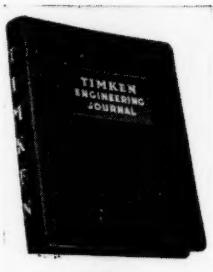

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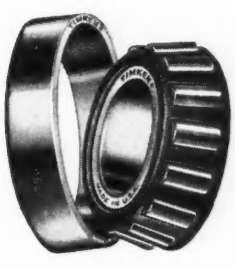

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Roach on fruit trees in England and consisted in injecting the chemicals, in the form of tablets, into the wood of the tree via two holes one centimeter in diameter and 4 centimeters deep. Within a week the effect of the injection with $CuSO_4$ was seen in an increased flow of latex amounting to 181%, as compared with the flow from the untreated control; the latex, be it noted, had a lower dry rubber content than that from the untreated tree. After the second week the rate of increase gradually diminished until at the end of the second month there is a brief upsurge before the rate again falls. From October 10, 1949, to March 19, 1950, the accumulated increase in rubber obtained from 4 trees, as compared with the yields from their twin controls during the same period, totaled more than six kilograms.

The experiments have admittedly not been carried out on a sufficiently large number of trees or for a long enough time to permit definite conclusions as to the value of the method. Many questions will be attempted to answer by further experimentation as (1) whether the increases are obtained at the expense of future yields; (2) whether the use of copper sulfate will lead to deterioration of the quality of the rubber; (3) what damage the treatment by injection does to the tree; (4) whether the treatment can be profitably repeated on the same trees.

The authors point out that so far no drop in yield below the normal level has been observed in the case of trees treated with $CuSO_4$. Nor does the boring of the tree appear to have had any adverse effect on the tree trunk as yet. The very small amount of copper present, they add, should not prove deleterious, but experiments have already been started with alternative substances and methods (2,4 D).

In any case, they conclude, even if no immediate light is thrown on the problem under investigation, the results already obtained open the way for new research on the physiology of *Hevea* and the metabolism of rubber—for instance, it may further the work already started on the subject of the enzymes of rubber.

INDONESIA

Borax-casein solutions, usually employed to aid in dispersing vulcanizing ingredients in latex, have two disadvantages for consumers in Indonesia—first, it requires foreign currency to obtain; then it does not keep well, spoiling when stored. It was therefore decided at the Indonesia Rubber Research Institute (I.N.I.R.O.) to conduct trials with a product marketed under the name of Acto 600, as dispersing agent. This is described as a sulfonate derived from mineral oil; it is a thick, yellow-brown substance resembling soft soap and having the odor of a lubricating oil. Results of comparative tests proved Acto 600 to be a satisfactory dispersing agent, also for use in the manufacture of Mealorub; like borax-casein solutions, it increases the mechanical stability of latex, though not to quite the same extent. The dispersing agent has a thickening effect on latex, however, which could prove a disadvantage in some cases, but in others it would preclude the use of additional thickening agents. The product has in its favor the fact that it can be purchased locally without the need of foreign currency and that, unlike the borax-casein solutions, it resists bacteria and hence can be stored without danger of spoiling.

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SEE PAGE 392

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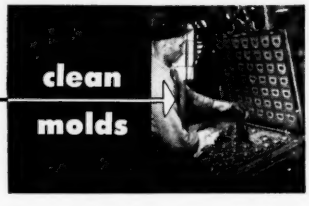

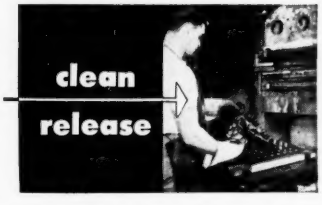

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The new building of the I.N.I.R.O. at Bogor was officially opened on April 13, 1950, in the presence of a large gathering of prominent personages including ministers of the Indonesian Government and representatives of Dutch, British, and French research associations in Europe and the Far East. M. D. Farrow, chairman of the board of directors of the I.N.I.R.O., welcomed the assembled and introduced the first speaker, the Minister for Progress of the Indonesian Republic, Mr. Djuanda who in the course of his speech emphasized the importance for Indonesia of a thriving rubber industry and the need of centralization and investigation to this end. G. J. van der Bie, director of the I.N.I.R.O., sketched the work of the Institution and the collaboration with rubber institutes in other countries. He pointed to the possibilities for considerably increased world consumption of rubber, citing, as instance, the fact that in the United States the annual per capita consumption was about 15 pounds, against less than ½ pound per capita per annum, in Indonesia, a leading rubber growing country.

Exports of rubber from Indonesia in the first eight months of 1950 totaled 413,848 tons; shipments in August were estimated at 67,212 tons.

JAPAN

Statistics published by the General Headquarters of the Supreme Commander for Allied Powers shows that production of certain rubber goods, as cycle tires and tubes and footwear, especially, increased considerably during the first five months of 1950 and came close to the output for the whole of 1949. Outputs in 1948, 1949, and the first five months of 1950 and of 1949 are given in the table below:

			First 5 Months	
	1948	1949	1949	1950
Tires (in 1,000 units)				
Truck	369.6	482.4	220.7	166.8
Balloon	52.8	122.4	44.3	98.3
Motorcycle	129.6	198.0	77.3	181.1
Cart	20.4	36.0	15.9	29.9
Cycle	3,796.8	5,528.4	1,970.6	5,828.8
TOTAL	4,369.2	6,367.2	2,328.8	6,304.9
Tubes (in 1,000 units)				
Truck	379.2	469.2	212.7	167.1
Balloon	57.6	435.6	42.5	100.3
Motorcycle	129.6	193.2	78.0	133.0
Cart	21.6	43.2	15.2	32.9
Bicycle	3,872.4	5,684.4	2,142.0	5,670.9
TOTAL	4,460.4	6,525.6	2,490.4	6,104.2
Footwear (1,000 pairs)				
Rubber-soled socks	15,781.2	22,255.2	8,538.0	13,504.6
Canvas shoes	8,283.6	13,528.8	4,794.8	15,596.3
Rubber boots and shoes	4,292.4	5,698.8	2,666.2	5,608.9
TOTAL	28,357.2	41,482.8	15,999.0	34,709.8

EUROPE

FRANCE

Rubber Consumption Down

According to the Ministry for Industry and Commerce, total consumption of raw rubber by the French rubber industry in the first half of 1950 declined to 50,603 metric tons from 52,674 tons in the corresponding period of 1949. Of these amounts, the tire industry used 29,984 and 34,369 metric tons, respectively; while general rubber goods required 20,619 and 18,305 metric tons respectively.

An examination of the monthly figures reveals that actually the amounts of rubber used in general goods had declined steadily during the first four months of the year, followed by an increase

again; in the case of tires the trend was far more irregular—an initial increase in purchases was more than offset by a sharp cut in March and April, which an upswing in the next two months could not wholly equalize.

It is to be noted further that while the manufacture of automobile tires required 23,362 tons of rubber in the 1950 period, against 25,146 tons in 1949, only 59 tons of rubber went into truck tires in 1950 and 94 tons in 1949. As to general rubber goods, the considerable spurt in the use of rubber for sponge and foam products in the 1950 period is especially notable; of interest too is the increased use of rubber for artificial leather and for rubber thread. In connection with the latter it may be mentioned that France had had to import all her requirements of rubber thread until 1935, when the first factory for making rubber thread (of the square-cut type) was opened here. Over against the increases must be set a reduction of something like 35% in the use of rubber by the insulated cable and wire industry. The following table shows the consumption of rubber for some of the more important rubber products in the first half of 1950, as compared with the same period in 1949.

CONSUMPTION OF CRUDE RUBBER FOR VARIOUS MANUFACTURES

(In Metric Tons)

	January-June	
	1949	1950
Automobile tires	25,146	23,362
Tubes	3,390	2,773
Cycle tires	2,113	1,278
Tubes	886	511
Adhesives	344	491
Rubber thread	197	320
Rubberized fabrics	1,249	1,461
Hose and piping	1,745	1,544
Belting	1,168	1,014
Sponge and foam rubber	761	1,447
Rubber footwear	2,383	3,629
Heels and soles	1,906	2,389
Toys and sporting goods	501	565
Sanitary and surgical goods	508	517
Mechanical rubber goods	3,354	3,657
Ebonite	354	267
Electrical cables	2,404	1,558
Artificial rubber	599	794

Output of tires for automobiles and tractors came to 44,322 tons, and of tubes to 4,200 tons in the first half of 1950, as against 47,564 and 5,115 tons, respectively, in the first half of 1949.

Reports in the foreign press indicate that a marked shortage of tires exists in France, ascribed in part to the strikes in the tire factories in March and April, 1950 (which also account for the lower consumption of rubber and production of tires in the first half of 1950, as compared with 1949 figures) and in part to increased purchases by the army in the summer and, it is suggested in some quarters, by hoarders. At all events the importation of tires has been facilitated by the authorities. According to a German paper, the French Ministry for Industry and Commerce has ordered 70,000 automobile tires from Western Germany. A certain amount of tires is also coming in from Czechoslovakia (in fulfillment of the terms of a trade pact with France), it is added, and unlimited imports of tires have been permitted from Britain, Switzerland, Italy, and the Benelux countries.

Official figures give the imports of tires and tubes during the first half of 1950 as 4,664 tons, valued at the equivalent of $3,559,000, against 4,188 tons, value $3,307,114, in the whole of 1949. Imports from the United States were only 628 tons, value $817,374 in the 1950 period, against 2,492 tons, value $2,472,810, in all of 1949.

The French Office of Price Control has permitted tire manufacturers to raise their prices on all lines of tires by about 20%—added to an increase of 10—15% in last July.

New V-Belt

The Société Industrielle de Transmissions Colombes-Texrope is marketing a new V-belt, the "Electr'Oil" belt. It is described[1] as especially designed for use in industries where static plus inflammable dust, gases, or fluids increase fire hazards and risks of explosion, as in mines, the chemical, rubber, plastics, wood, and paper industries, etc. The belt consists of fabric plies impregnated and coated with a rubber composition rendered conductive by the addition of an active pigment. At the same time a special coating on the external, covering layer makes the belt resistant to mineral oils. At the I.F.C., sections of belt immersed for 24 hours in lubricating oil showed an increase of weight of less than 2.9%; while the breaking load was hardly affected, and the adhesion coefficient was only slightly reduced.

[1] *Rev. gén. caoutchouc*, Nov., 1950, p. 666.

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GREAT BRITAIN

Blow Heads Rubber Development Unit

C. M. Blow was recently appointed superintendent of Rubber Technical Developments, succeeding J. P. Griffiths. Dr. Blow comes to his new position after two years as superintendent of applied research at the British Rubber Producers' Research Association.

Rubber Technical Developments is a unit formed in 1949 by the British Rubber Development Board and BRPRA to promote and develop the increased use of natural rubber.

At the Rubber Technical Development laboratories, installation of new equipment is now nearing completion. This will enable new processes to be taken from the laboratory stage to commercial production, and it is hoped that a considerable saving of time in development work will thereby be achieved.

British Industry Notes

Ever since the war proved the importance of synthetic rubber, isolated voices have been heard here tentatively suggesting the advisability of having at least one synthetic rubber factory in Britain. Now at a meeting of the Institution of the Rubber Industry, G. E. Beharrel, managing director of Dunlop Rubber Co., Ltd., is reported to have spoken in favor of a synthetic rubber industry for the United Kingdom, which he stated would have the cooperation of consumers.

Even under conditions of world peace there were reasons why his suggestion should be examined—by the British chemical industry in the first place, he is quoted as having said and to have added that there was a field in special types which might form a basis for future expansion on an economic basis; furthermore that it was difficult to visualize a return of the United States synthetic rubber industry to volumes which were being considered only 12 months ago.

Dunlop stockholders have received a circular in which proposals for raising a substantial amount of new permanent capital have been outlined. Outside of £6,000,000 of debenture stock in 1946 (of which only half was new money) the company has made no issue of capital to stockholders or the general public since 1928. The present need of new capital has been brought about by the sudden rapid rise in the prices of raw rubber and cotton, which is using up in working capital resources that would otherwise be available for the expansions the company contemplates. The present unissued ordinary capital consists of £7,216,943 in shares of 6s8d each.

A Board of Trade inquiry is to be made into the affairs of P. B. Cow, Ltd. The concern, originally started more than 100 years ago, is manufacturer of Li-Lo products and various types of plastic goods. It has an issued capital of not quite £1,000,000, of which about half is in £1 preference shares and the remainder in 4s. ordinary shares. Apparently the company's operations ceased to be profitable in the last few years, for the payment of the preference dividend for 1949 had to be postponed, and the accounts for that year showed a net loss of £80,601.

GREECE

An ECA loan of $34,000 in foreign exchange for imported equipment and $15,000 for domestic expenditure has been granted an existing rubber goods factory which plans to expand. Another loan of $40,000 is being made available to a new rubber goods manufacturing plant in Saloniki, of which $10,000 will go toward importing machinery. The company will specialize in tire retreading, but intends also to manufacture rubber footwear, belting, hose, druggists' sundries, and similar items.

SWEDEN

The Swedish Plastics Federation plans a Plastics Exhibition to be held in Stockholm for about two or possibly three weeks during May, 1951.

Editor's Book Table

BOOK REVIEWS

"Colloid Chemistry, Theoretical and Applied. Volume VII. Theory and Methods, Biology and Medicine, Technological Applications." Collected and edited by Jerome Alexander. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Cloth, 6 by 9 inches, 748 pages Price, $15.

This newest addition to the well-known series on colloid chemistry contains 43 papers contributed by international authorities. Although grouped into the three sections shown in the subtitle of the volume, the papers cover widely different fields. As such, they are especially valuable in providing a quick review of work in other fields that may prove applicable to the reader's field. The first section, Theory and Methods, comprises 11 papers covering the basic structure and behavior of matter at various structural levels. Of particular interest to the rubber and plastics industries are the following papers in this section: "Scattering by Inhomogeneous Materials," P. Debye and A. M. Bueche; "The Role of the Electric Double Layer in the Behavior of Lyophobic Colloids," E. J. W. Verwey; "The Effective Depth of the Surface Zone of a Liquid," J. W. McBain and J. C. Henniker; "Laws of Surface Tension as Evidence of Aggregates in Liquids," G. Antonoff; "Newtonian Flow in Polymer Chemistry," A. K. Doolittle; and "Successive Levels of Material Structure," J. Alexander.

The second section, Biology and Medicine, includes 11 papers on proteins, enzymes, drugs, genetics, tuberculosis, blood types, and dental caries. The third section, Technological Applications, consists of 21 papers, including the following: "Sonic Agglomeration of Carbon Black Aerosols," C. A. Stokes; "Organophilic Clays," E. A. Hauser; "The Reclaiming of Elastomers," D. S. le Beau; "Chemical and Physical Modifications of Textile Fibers," H. C. Borghetty; "Cellophane," C. M. Rosser; "Protective Wrappings—British Approach," C. R. Oswin; "Packaging—American Problems," C. A. Southwick, Jr.; and "Freeze-Drying," E. W. Flosdorf. Bibliographies are appended to each paper, and the book includes comprehensive author and subject indexes.

"Modern Chemical Processes." By the Editors of *Industrial and Engineering Chemistry*. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Cloth, 8 x 11¼ inches, 222 pages. Price, $4.

This volume consists of reprints of 23 plant process articles which have appeared in *Industrial and Engineering Chemistry* since February, 1948. They were written by magazine staff members in cooperation with the technical staff of the industrial organization concerned. Unlike the usual general survey, these articles include a great deal of chemical, manufacturing, and engineering knowledge and techniques and will be of value as a reference work, particularly for college use. It is planned to issue a new volume every two years to incorporate the 24 articles published during that period and thereby keep the information up to date for ready reference.

Articles included in this volume cover contact sulfuric acid manufacture; production of chlorine and caustic soda; iodine from oil well brines; continuous superphosphate production; barium potassium chromate pigment; fine chemicals from coal; liquid fuel from coal; synthetic methanol production; alcohols by sodium reduction; low temperature manufacture of chemical rubber; carotene and chlorophyll; chloroquine manufacture; paint and varnish manufacture; petroleum-base protective coatings; drier soap manufacture; continuous distillation of gum turpentine; selective extraction of vegetable oils with furfural; solvent extraction of oil from soybeans; phenolic resin glues for plywood; oxidation of cellulose; manufacture of basic refractory brick; paving asphalt from California crude oil; and citrus fruit processing. An extensive subject index is also included, in addition to bibliographies for the articles.

"A Manual of Plastics and Resins in Encyclopedia Form." Edited by William Schack. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth, 6 by 9 inches, 550 pages. Price, $10.

Intended as a handy reference work on the materials, processes, products, and equipment of the plastics industry, this book contains some 1,500 subject descriptions arranged in alphabetical order. In addition to short definitions and descriptions, the book contains many articles contributed by 150 authorities in the field which provide encyclopedic and condensed information on the

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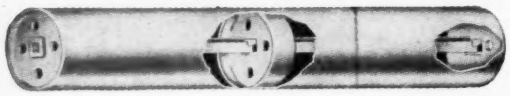
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subjects concerned. The inclusion of many illustrations, tables, diagrams, and cross-references add to the usefulness of this book. While the expected descriptions of materials, processes, and equipment all appear in this book, major fields of applications for plastics are also discussed in detail. These discussions, covering such fields as aircraft, automotive, electrical appliances, housewares, refrigerators, etc., give detailed information on the plastic components used and the reasons for such use. While of interest to plastics technologists, the value of this book to the end-user of plastics is noteworthy.

NEW PUBLICATIONS

Publications of Pittsburgh Coke & Chemical Co., Grant Bldg., Pittsburgh 19, Pa. **"Pittsburgh Plasticizer PX-104, Dibutyl Phthalate."** Bulletin No. PX-104. 1 page. **"Pittsburgh Plasticizer PX-108, Diisooctyl Phthalate."** Bulletin No. PX-108. 1 page. **"Pittsburgh Plasticizers PX-138, Dioctyl Phthalate."** Bulletin No. PX-138. 1 page. The data sheet on each of these products gives properties of the pure compound, sales specifications, commercial information on containers and shipping, compatibility with various natural and synthetic resins, and a description of the products' uses.

"Fast Butyl Cures with Vulklor, G-M-F, and Dibenzo G-M-F." Compounding Research Report No. 14. Naugatuck Chemical Division, United States Rubber Co., Rockefeller Center, New York 20, N. Y. 18 pages. Formulations and test data show that Butyl stocks with Vulklor activation of G-M-F and Dibenzo G-M-F vulcanizing agents are fast curing, have a high modulus and superior aging properties, are non-blooming and non-tarnishing, have reasonable processing safety, and are cheaper than previous dioxime-type cures.

"Baldwin-Defiance Compacting Presses." Bulletin 23. Baldwin Locomotive Works, Philadelphia 42, Pa. 4 pages. Two compacting presses, Models 20 and 45, are illustrated and described for use in plastics preforming and for compacting in the ceramics and powder metal industries. Specifications are given, together with design characteristics, for the presses.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. **"Thionex-MBTS Combinations as Accelerators for Rubber and GR-S."** BL-239. 4 pages. Formulations and test data reveal that Thionex is an economical and practical accelerator for use with MBTS in general compounding of natural rubber and GR-S.

"Effect of NA-22 on the Stability of 'Sulfur-Modified' Neoprene Stocks." BL-240. 2 pages. Data indicate that Neoprene Types GN, GN-A, and RT stocks accelerated with NA-22 not only have excellent processing safety at high temperatures, but are more stable under normal bin storage conditions than similar stocks containing no accelerator.

"Neoprene Extruded Goods." F. H. Fritz. Report No. 50-6, October, 1950. 32 pages. The compounding, processing, vulcanization, properties, and applications of neoprene extruded goods are discussed in detail. Also included are formulations and test data for many types of extruded products, such as tubings, strips, gaskets, jar rings, and hose.

"Effect of Compounding on Ozone Resistance of Neoprene Vulcanizates." BL-238, September 29, 1950. 4 pages. This report discusses the ozone resistance of various neoprene factors detrimental to ozone resistance, and the effect of waxes and antioxidants in improving ozone resistance.

Publications of Indoil Chemical Co., 910 S. Michigan Ave., Chicago 80, Ill. **"Compatibility of Indonex Plasticizers with Resins, Waxes and Pitches."** Circular No. 105. 6 pages. Data in tabular form cover the compatibility of Indonex with a wide variety of natural and synthetic resins, waxes, and pitches. A viscosity-temperature chart for petroleum products is also included. **"Indonex Plasticizers in Reclaim Compounds."** Circular No. 13-43. 5 pages. Data appear on the effect of Indonex plasticizers on a series of inner tube and whole tire reclaim stocks, both with and without the use of 10% GR-S. **"Indonex Plasticizers in Super-Aging Neoprene Compounds."** Circular No. 13-44. 3 pages. Formulations and test data reveal that the low volatility of Indonex plasticizers makes them especially suitable for use in super-aging neoprene stocks.

"Talcs—Magnesium Silicate, Pyrophyllite, Soapstone, Steatite." Whittaker, Clark & Daniels, Inc., 260 W. Broadway, New York 13, N. Y. 105 pages. In addition to general information on talcs and their sources, this booklet is divided into three sections. The first section indicates the importance of the various talcs to specific industries. The second section presents typical physical and chemical properties for the company's complete line of about 100 different talcs. The concluding section on specialties gives information on various pyrophyllites, soapstones, wonderstone, Softex fillers, special talcs, and Clover Brand soapstone crayons. Besides a standard index on its talcs, the catalog also indexes the firm's talcs by geographical origin and by special properties.

"Guide to Geon Latices for the Packaging Field." B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. 4 pages. This bulletin features a chart tabulating the properties of six Geon latices suitable for packaging use. Properties are given for the latex, cast film, and latex coated paper, together with related information and typical applications. Brief descriptions are also included of Geon Polyblend and Geon resins for solutions.

"Industrial Research Newsletter." Vol. 1, No. 1, November 1950. Armour Research Foundation, Illinois Institute of Technology, Chicago 16, Ill. 4 pages. This is the first issue of a new bimonthly publication presenting condensed information on scientific, technological, and engineering developments for use by executives, research directors, and technical personnel.

"A.S.T.M. Standards on Textile Materials (with Related Information.)" American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Paper, 5⅞ by 9 inches, 584 pages. Price, $4.50. This latest compilation includes in their latest form some 90 specifications, test methods, and tolerances developed by ASTM Committee D-13 on Textile Materials. Related information includes photomicrographs of textile fibers, a glossary of terms, properties of fibers, relative humidity and yarn number conversion tables, and other material.

Bulletins of M. W. Kellogg Co., Jersey City, N. J. **"Kel-F Modification of Properties by Heat Treatment."** Bulletin #2-10-50. 2 pages. **"Kel-F Molding Techniques."** Bulletin #3-10-50. 7 pages. These bulletins, revisions of previous reports, incorporate the latest information on the modification of Kel-F properties by heat treatment and molding techniques, respectively. **"Kel-F Dispersions."** Bulletin #4-10-50. 2 pages. Properties of two types of Kel-F dispersions are given together with information on methods of application and properties of the finished coating.

"Bibliography of Recent Research in the Field of High Polymers." Robert Simha, Irma G. Callomon, Mary Budge Gaughan, and Helen H. Jeppson. National Bureau of Standards Circular 498. 60 pages. For sale by the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. Price, 20¢. This bibliography of classified references in the high polymer field is taken from American periodicals from January, 1946, through December, 1949, and from available foreign periodicals up to January 1, 1950.

"Cyanamid New Product Bulletin. Collective Volume II." American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y. 86 pages. This collective volume includes seven booklets on new products issued by the company since December, 1949. Products covered are beta-substituted propionitriles, 3-substituted propylamines, dipropionitriles, 2-nitrodiphenylamine, Antioxidant 2246, 2-aminobenzenethio, and sodium dicyanamide. Information on each product includes properties, chemical reactions, potential applications, toxicity, and bibliography.

"The Story of U. S. Naugahyde." United States Rubber Co., Rockefeller Center, New York 20, N. Y. 24 pages. This illustrated booklet on the company's vinyl material offers a brief discussion of vinyls, describes how vinyl upholstery materials are made, reviews essential qualities needed for best performance, and gives color samples of materials available.

"B. F. Goodrich Conveyer and Elevator Belts." Catalog Section 2200-2250. The B. F. Goodrich Co., Akron, O. 26 pages. This booklet describes and illustrates the firm's conveyer and elevator belts, including information on belt features, the function which each part of the belt performs, and belt sizes.

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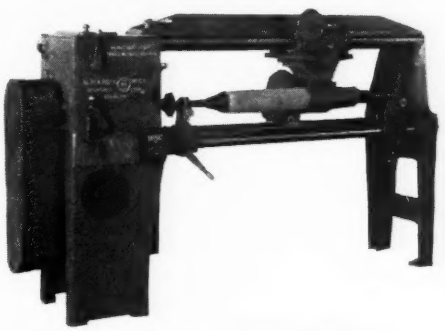

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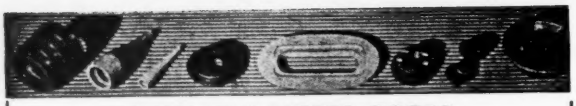

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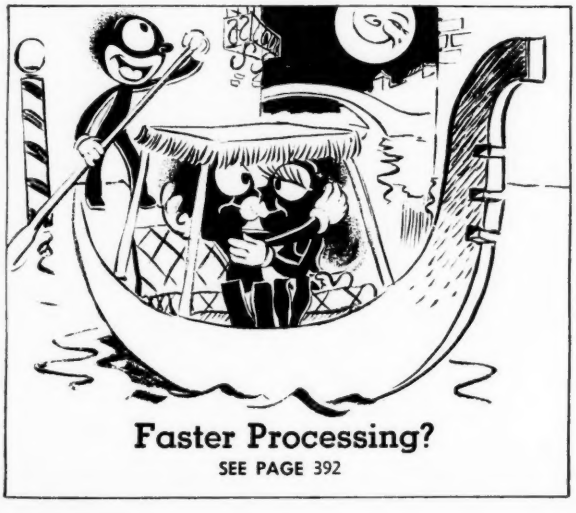

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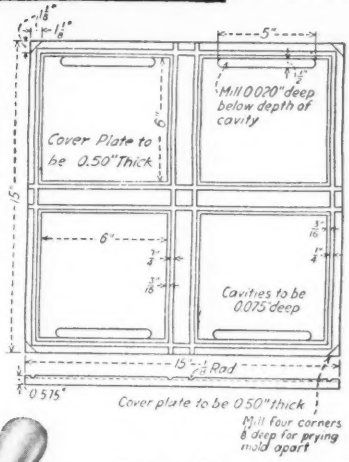
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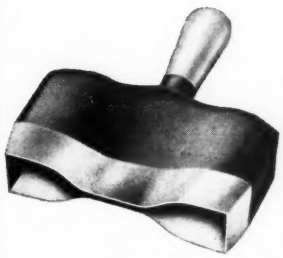
Mill four corners ⅛ deep for prying mold apart



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MARKET REVIEWS

CRUDE RUBBER

Commodity Exchange

WEEK-END CLOSING PRICES

Futures	Oct. 28	Nov. 18	Nov. 25	Dec. 2	Dec. 9	Dec. 16
Feb.	55.75	67.87	55.80	62.12	56.37	57.00
Apr.	50.25	60.25	49.60	53.12	51.12	51.50
June	46.25	54.00	45.05	49.00	47.00	47.75
Aug.	44.50	50.50	42.50	47.25	45.00	45.50
Oct.	43.50	49.50	41.50	46.25	44.00	44.50
Dec.	42.50	48.50	40.50	45.25	43.00	43.50
Total weekly sales, tons	3,250	6,160	3,870	3,720	3,270	1,530

TRADING in rubber futures was slow and irregular on the New York Commodity Exchange during the period from November 16 to December 15. Prices moved downward, with most activity concentrated in nearby deliveries because of the expectation of government controls in the immediate future. This fear was also reflected by the widening spread between near and distant months and was further intensified by the uncertainty affecting the physical market.

February futures began the period at 65.95¢, rose to a high of 67.87¢ on November 17, declined to 63.87¢ on November 30 and a low of 52.75¢ on December 13, and then recovered slightly to close at 57.00¢ on December 15. Other futures showed corresponding movements. Sales during November totaled 19,200 tons, as compared with October's already low figure of 19,940 tons; while sales for the first half of December totaled 6,260 tons.

New York Outside Market

WEEK-END CLOSING PRICES

	Oct. 28	Nov. 18	Nov. 25	Dec. 2	Dec. 9	Dec. 16
N. 1 R.S.S.:						
Spot	64.50	77.50	63.50	72.50	68.50	69.50
Jan.	57.00	67.00	56.00	62.00	59.00	60.00
Feb.	57.00	67.00	56.00	60.00	57.00	58.00
Mar.	57.00	67.00	56.00	58.00	55.00	56.00
No. 3 R.S.S.	63.50	75.50	61.00	70.50	66.50	67.50
No. 2 Brown	58.50	70.50	56.50	65.50	61.50	62.50
Flat Bark	53.50	62.50	50.50	60.50	56.50	57.50

UNCERTAINTY over the future and an attitude of watchful waiting by purchasers keynoted the New York Outside Market during the period from November 16 to December 15. Prices began the period with a sharp drop when offerings of crude rubber from the Far East poured into the market at workable price levels. This flood of rubber was said to have resulted from the action of Malayan rubber producers and dealers in unloading all available stocks before their new export tax went into effect. Contributing factors were also the concerted withdrawal of purchasers from the domestic market and the fear that another sharp price advance would draw punitive action from the government in Washington.

A moderate recovery took place during the last few days of November in the face of unfavorable reports from Korea, but this recovery was shortlived. During the first half of December, prices were irregular, and trading was light as the industry awaited the imposition of government controls over rubber imports. The announcement of higher synthetic rubber prices, effective December 7, had no effect on the market in view of the uncertainty existing over the course of government action.

The spot price for No. 1 R.S.S. opened the period at 74.50¢, rose to a high of 77.50¢ on November 17, dropped to a low of 63.50¢ on November 24 and 27, and closed at 72.50¢ on November 30. The spot price began December at 72.50¢, fluctuated between 65.00 and 70.00¢, and closed at 69.50¢ on December 15. No. 3 sheets went from 72.50¢ on November 16 to a high of 75.50¢ on November 17, a low of 61.00¢ on November 24 and 27, and closed the period at 67.50¢. No. 2 Brown went from 67.50¢ on November 16 to 62.50¢ on December 15, with a high of 70.50¢ on November 17 and a low of 56.50¢ on November 24 and 27. Flat Bark prices moved from 59.50¢ on November 16 to 57.50¢ on December 15, with a high of 62.50¢ on November 17 and a low of 50.50¢ on November 24 and 27.

Monthly average closing spot prices for November of the different rubber grades were as follows: No. 1 R.S.S., 74.00¢; No. 3 R.S.S., 72.33¢; No. 2 Brown, 67.55¢; and Flat Bark, 60.95¢.

Latices

THERE are now two opinions as to the future of *Hevea* latex, according to Arthur Nolan, writing in the December issue of *Natural Rubber News*. One group believes that production of non-essential products will soon be reduced, limited, or eliminated, and that the current high level of *Hevea* latex consumption will be drastically reduced since many of its major applications are not essential products. The other group thinks that while the immediate international situation is acute, the long-range prospects are brighter, and high-level production and consumption of *Hevea* latex should continue in order to provide large quantities in case of a sudden emergency.

The statistical position of *Hevea* latex is at a most favorable point. Supplies are coming forward at a greatly accelerated rate and can permit achievement of the 10,000-ton stockpile goal while allowing even greater consumption. Supplies of drummed latex are also being received in increasing amounts to add to the overall picture. October imports of *Hevea* latex are estimated at 5,161 long tons, dry weight; consumption, 5,431 long tons; and month-end stocks, 4,807 tons.

Hevea latex prices maintained a differential of 8.5-10.5¢ a pound over No. 1 R.S.S. spot prices during the period from November 16 to December 15. Should the government become the sole buyer and importer of rubber here, the Singapore market will probably be used to price latex. Such a move will require the establishment of new latex price differentials and include new freight and insurance costs.

Supplies of both neoprene and GR-S latices continue tight. November production of GR-S latex is estimated at 2,704 long tons, dry weight. On December 7 the RFC increased the price of low-solids GR-S latex to 24.5¢ a pound, and high-solids latex to 26.5¢ a pound, plus uniform freight charges.

SCRAP RUBBER

THE scrap rubber market was steady and moderately active during the period from November 16 to December 15. Although some reclaimers were said to be taking carload lots only and others were insisting on segregation of tires, movement of scrap rubber continued in fair volume. Mixed auto tires rose $1 per ton at Akron, and this advance was followed by a $3 per ton increase in the East to meet Akron competition. Tube scrap demand was firm, and both red and black passenger tubes advanced 0.25¢ per pound in the East and at Akron. On the export side, some scrap shipments were made to Spain and Portugal, and inquiries were received from France and Germany.

Following are dealers' selling prices for scrap rubber, in carload lots, delivered to mills at the points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$28.00	$31.00
Peelings, No. 1	60.00	60.00
3	35.00	35.00
	(¢ per Lb.)	
Black inner tubes	8.25	8.25
Red passenger tubes	12.25	12.25

RECLAIMED RUBBER

NO CHANGES in the reclaimed rubber market picture occurred during the period from November 16 to December 15. Production and sales continued at peak levels, and reclaimers' allocation systems remained in effect. First-quality whole tire reclaims were quoted at firm prices through January, but all other reclaims were on a nominal basis. Even further increases in demand for reclaim are expected to result from additional cutbacks in crude rubber consumptions during the next month or more, so that the tight reclaim situation can be expected to continue in the near future.

Final September and preliminary October statistics on the domestic reclaimed rubber industry are now available. September production totaled 29,648 long tons; imports, 101 long tons; consumption, 29,250 long tons; exports, 1,177 long tons; and month-end stocks, 33,395 long tons. Preliminary figures for October show a production of 32,663 long tons; consumption, 32,260 long tons; exports, 988 long tons; while month-end stocks were estimated at 32,602 long tons.

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	10.00/10.75
Peel	1.18-1.20	nom.
Inner tube		
Black	1.20-1.22	nom.
Red	1.20-1.22	nom.
GR-S	1.18-1.20	nom.
Butyl	1.16-1.18	nom.

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

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(*Classified Advertisements Continued on Page* 503)

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE
WEEK-END CLOSING PRICES

Futures	Oct. 28	Nov. 18	Nov. 25	Dec. 2	Dec. 9	Dec. 16
Mar.	40.60	43.09	42.87	42.10	41.80	42.65
May	40.36	42.61	42.14	41.52	41.22	42.02
July	39.94	41.86	41.40	40.96	40.77	41.65
Oct.	36.40	37.29	36.35	37.04	37.04	38.32
Dec.	36.28	36.82	35.80	36.63	36.69	37.92
Mar.	36.20	36.70	35.70	36.38	36.42	37.75

UNCERTAINTY and irregular price movements characterized the cotton market on the New York Cotton Exchange during the period from November 16 to December 15. At the beginning of the period prices moved upward as the result of strong price fixing and short covering based on the tense international situation, the high domestic rate of consumption, the increase in export quotas, and the generally low level of domestic cotton prices as compared with world cotton market prices.

This advance subsided quickly as fears grew of price controls. Cotton was not subject to price control during the last war, but at that time there was a large stockpile which does not exist at present. As a result, many believe that cotton will be included in any new control program. On the other hand, many traders think that cotton would not be included in the initial price controls or for at least some time. In addition, the main governmental objective is to increase sharply cotton production in 1951, and imposition of ceilings might act as a deterrent to planting. Toward the end of the period heavy military demands spurred market buying, and prices rose slowly.

The 15/16-inch middling cotton spot price started the period at 43.72¢, rose to a high of 44.80¢ on November 20, was quoted at 43.55¢ on November 30, fell to a low of 42.30¢ on December 4, and closed at 43.35¢ on December 15. March futures prices showed corresponding movement, starting the period at 42.40¢, reaching a high of 43.57¢ on November 22 and a low of 40.85¢ on December 4, and closing at 42.15¢ on December 15.

Fabrics

Most prices in industrial cotton goods rose during the market period in the face of short supplies for nearby delivery. Most mills were reported to be withdrawn for second quarter, 1951, deliveries, and sales in some constructions were reported into next fall. Army procurement needs began to take effect, particularly in ducks, drills, and other wide goods. Some mills are switching looms from other constructions to specific duck goods to meet the need, and the industry in general is working on plans to increase duck production for the Armed Forces.

Some second-quarter sales in cotton tire cord and fabrics were reported, and most cotton tire cord mills are currently operating on the three-shift six-day weekly basis to meet the increased demand from both domestic and foreign tire manufacturers. Print cloths sold heavily into the second quarter, and only small lots were still available for first-quarter delivery.

Cotton Fabrics

Drills		
59-inch 1.85-yd.	*yd.*	$0.49
2.25-yd.		.42
Ducks		
38-inch 1.78-yd. S. F.	*yd.*	$.487½ / $.495
2.00-yd. D. F.	*yd.*	.445 / .45
51.5-inch, 1.35-yd. S. F.		.645 / .65⅛
Hose and belting		.80
Osnaburgs		
40-inch 2.11-yd	*yd.*	.37
3.65-yd	*yd.*	.235
Raincoat Fabrics		
Bombazine, 64x60 5.35-yd	*yd.*	nom.
Print cloth, 38½-inch, 64x60		.22
Sheeting, 48-inch, 4.17-yd		.26⅞
52-inch 3.85 yd.		.29⅛
Chafer Fabrics		
14-oz./sq. yd. Pl.	*lb.*	.83 / .865
11.65-oz./sq. yd. S.		.81⅝
10-80-oz./sq. yd. S.		.48⅞ / .495
8.9-oz./sq. yd. S.		.445 / .45
Other Fabrics		
Headlining, 59-inch 1.35-yd., 2-ply	*yd.*	.62
64-inch, 1.25-yd. 2-ply		.725
Sateens, 53-inch 1.32-yd		.71 / .725
58-inch 1.21-yd		.775 / .78
Tire Cords		
K. P. std., 12-3-3	*lb.*	nom.
12-4-2		.95

RAYON

TOTAL rayon shipments from producers to domestic consumers during November totaled 104,600,000 pounds, a decline of 3% from the October figure. November shipments of rayon filament yarn at 79,600,000 pounds were 4% below those of the preceding month. Total rayon yarn shipments during November consisted of 20,500,000 pounds of viscose high-tenacity yarn, 27,000,000 pounds of viscose and cupra textile yarn, and 26,100,000 pounds of acetate yarn. Producers' stocks at the end of November totaled 14,400,000 pounds, 1% above the October level.

Production figures for tire cord and fabric for the first three quarters of 1950 were issued by the Bureau of the Census, United States Department of Commerce. These figures are as follows:

TIRE CORD AND FABRIC
(All Figures in Million Pounds)

	First Quarter	Second Quarter	Third Quarter
Cotton, except chafer	23	41	48
Chafer fabric	13	14	17
Rayon and nylon	73	71	75
Totals	109	126	140

On December 1 the National Production Authority issued Regulation M-13 to insure equitable distribution of defense contracts among the high tenacity rayon yarn producers. This order states that no producer need except DO orders for any one month in excess of 10% of his scheduled production and give producers the right to reject a defense rated order if received 30 days before the first day of the month in which shipment is requested. The order noted that although high-tenacity yarn is used primarily in tires, it is also used for cargo and flare chutes, airplane fuel cell fabrics, and other defense purposes.

Rayon Prices

Tire Yarns	
1100/ 480	$0.62/$0.63
1100/ 490	.62
1150/ 490	.62
1650/ 720	.61/.62
1650/ 980	.61
1900/ 980	.61
2200/ 960	.61
2200/ 980	.60
4400/2934	.63
Tire Fabrics	
1100/490/2	.72
1650/980/2	.695/.73
2200/980/2	.685

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, Inventory, October, September, 1950; First 10 Months, 1950, 1949

	October, 1950	% of Change from Preceding Month	September, 1950	First 10 Months, 1950	First 10 Months, 1949
Passenger Casings					
Shipments					
Original equipment	3,389,241		3,415,067	31,029,792	24,647,889
Replacement	3,877,064		3,511,661	40,610,294	31,362,770
Export	73,841		48,531	507,832	420,514
TOTAL	7,340,146	+ 5.23	6,975,259	72,147,918	56,431,173
Production	7,313,860	+10.47	6,620,742	66,658,920	54,749,227
Inventory end of month	3,483,383	− 0.40	3,497,333	3,483,383	7,060,481
Truck and Bus Casings					
Shipments					
Original equipment	393,061		398,857	3,862,815	3,032,030
Replacement	897,392		788,194	8,101,557	5,745,884
Export	78,457		64,004	636,718	816,397
TOTAL	1,368,910	+ 9.42	1,251,055	12,601,090	9,594,311
Production	1,345,287	+12.59	1,194,871	11,765,908	9,311,145
Inventory end of month	898,902	− 2.90	925,699	898,902	1,637,498
Total Automotive Casings					
Shipments					
Original equipment	3,782,302		3,813,924	34,892,607	27,679,919
Replacement	4,774,456		4,299,855	48,711,851	37,108,654
Export	152,298		112,535	1,144,550	1,236,911
TOTAL	8,709,056	+ 5.87	8,226,314	84,749,008	66,025,484
Production	8,659,147	+10.79	7,815,613	78,424,828	64,060,372
Inventory end of month	4,382,285	− 0.92	4,423,032	4,382,285	8,697,979
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	3,782,338		3,807,464	34,883,786	27,603,523
Replacement	3,542,379		3,681,537	36,176,628	27,137,504
Export	93,274		66,891	647,604	774,706
TOTAL	7,417,991	− 1.83	7,555,892	71,708,018	55,515,733
Production	7,987,691	+12.92	7,073,600	67,788,600	54,648,109
Inventory end of month	6,400,392	+ 4.42	6,129,401	6,400,392	8,609,065

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

STAMFORD "FACTICE" VULCANIZED OIL

(Reg. U. S. Pat. Off.)

Our products are engineered to fill every need in natural and synthetic rubber compounding wherever the use of vulcanized oil is indicated.

We point with pride not only to a complete line of solid Brown, White, "Neophax" and "Amberex" grades, but also to our aqueous dispersions and hydrocarbon solutions of "Factice" for use in their appropriate compounds.

Continuing research and development in our laboratory and rigid production control has made us the leader in this field.

The services of our laboratory are at your disposal in solving your compounding problems.

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Stamford, Conn.

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Regular and Special Constructions of

COTTON FABRICS

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Ducks

HOSE and BELTING

Ducks

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Osnaburgs

Curran & Barry

320 BROADWAY

NEW YORK

United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	September, 1950 Quantity	Value
UNMANUFACTURED, Lbs.		
Crude rubber	125,397,682	$36,724,072
Latex	11,461,876	4,369,707
Crude chicle	1,525,720	1,313,810
Guayule	122,800	15,148
Balata	265,466	102,475
Jelutong or Pontianak	391,324	146,493
Gutta percha	83,109	59,004
Synthetic rubber	4,361,933	783,295
Reclaimed rubber	225,486	16,293
Scrap rubber	8,679,254	277,967
TOTALS	152,514,650	$43,808,264
MANUFACTURED		
Tires and casings: auto, etc. *no.*	3,928	$56,569
Bicycle *no.*	5,282	5,011
Other *no.*	552	346
Inner tubes: auto, etc. *no.*	152	467
Rubber footwear:		
Boots *prs.*	24,062	64,229
Shoes and overshoes *prs.*	7,286	8,652
Rubber-soled canvas shoes *prs.*	12,096	5,883
Athletic balls: golf *no.*	77,460	16,123
Tennis *no.*	3,552	468
Other *no.*	47,162	2,771
Rubber toys, except balloons	.....	30,033
Hard rubber goods	.....	37,933
Rubberized printing blankets *lbs.*	325	861
Rubber and cotton packing *lbs.*	3,142	4,080
Molded rubber insulators	.....	998
Hose and tubing	.....	5,691
Drug sundries	.....	1,314
Rubber instruments *doz.*	598	937
Other rubber goods	.....	303
Gutta percha manufactures *lbs.*	1,548	1,153
Rubber bands *lbs.*	504	633
Synthetic rubber goods	.....	310
Other soft rubber products	.....	124,968
TOTALS	.....	$369,733
GRAND TOTALS, ALL RUBBER IMPORTS	.....	$44,177,997

Exports of Domestic Merchandise

	September, 1950 Quantity	Value
UNMANUFACTURED, Lbs.		
Chicle and chewing gum bases	370,961	$153,412
Balata	1,500	3,660
Synthetic rubbers: GR-S	284,500	73,576
Butyl	20,000	3,380
Neoprene	664,433	238,960
Nitrile	439,714	201,227
"Thiokol"	1,000	387
Polyisobutylene	29,713	9,468
Other	5,175	15,256
Reclaimed rubber	2,636,332	223,758
Scrap rubber	7,358,461	168,334
TOTALS	11,811,789	$1,091,218
MANUFACTURED		
Rubber cement *gals.*	95,108	$191,364
Rubberized fabric: auto cloth *sq. yds.*	9,400	7,212
Piece goods and hospital sheeting *sq. yds.*	86,827	58,329
Rubber footwear:		
Boots *prs.*	1,926	7,595
Shoes *prs.*	8,687	16,483
Rubber-soled canvas shoes *prs.*	21,360	35,577
Soles *doz. prs.*	24,411	71,611
Heels *doz. prs.*	62,486	54,427
Soling and toplift sheets *lbs.*	266,120	57,421
Gloves and mittens *doz. prs.*	15,271	50,323
Drug sundries: hot water bottles and fountain syringes *no.*	19,056	14,127
Other	.....	175,611
Rubber and rubberized clothing	.....	161,740
Toy and novelty balloons	.....	28,381
Toys and balls	.....	58,272
Erasers *lbs.*	28,127	19,829
Hard rubber goods:		
Battery boxes *no.*	36,790	53,796
Other electrical goods *lbs.*	106,385	58,732
Combs, finished *doz.*	1,143	1,631
Other	.....	11,028
Tires and casings:		
Truck and bus *no.*	60,798	2,260,160
Auto *no.*	46,446	667,993
Aircraft	.....	68,492
Farm tractor, etc *no.*	4,197	144,496
Other off-the-road *no.*	6,286	598,830
Bicycle *no.*	6,605	8,208
Motorcycle *no.*	517	3,796
Other *no.*	3,261	47,480
Inner tubes: auto *no.*	26,699	53,594
Truck and bus *no.*	23,425	95,043
Aircraft *no.*	219	2,261
Other *no.*	8,195	32,146
Solid tires: truck and industrial *no.*	1,567	54,481
Tire repair materials:		
Camelback *lbs.*	329,707	98,044
Other *lbs.*	188,354	185,227
Rubber and friction tape *lbs.*	29,462	21,358
Belting: auto and home *lbs.*	69,361	87,636
Transmission:		
V-belts *lbs.*	109,070	183,850
Flat belts *lbs.*	20,376	28,233
Other *lbs.*	17,307	22,334
Conveyer and levitator *lbs.*	65,011	48,494
Other *lbs.*	1,473	1,472
Hose and tubing *lbs.*	407,505	281,271
Packing *lbs.*	141,086	129,434
Mats, flooring, tiling *lbs.*	540,217	138,968
Thread: bare *lbs.*	16,011	24,331
Textile covered *lbs.*	18,812	47,273
Gutta percha manufactures *lbs.*	1,445	2,898
Latex and other compounded rubber for further manufacture *lbs.*	919,740	329,229
Other natural and synthetic rubber manufactures	.....	406,325
TOTALS	.....	$7,206,846
GRAND TOTALS, ALL RUBBER EXPORTS	.....	$8,298,034

Reexports of Foreign Merchandise

UNMANUFACTURED, Lbs.		
Crude rubber	1,968,682	$798,935
Balata	27,599	15,163
Scrap rubber	22,254	2,225
TOTALS	2,018,535	$816,323
MANUFACTURED		
Drug sundries, except hot water bottles and fountain syringes	.....	$683
Rubber and rubberized clothing	.....	336
Toy and novelty balloons	.....	884
Rubber toys and balls	.....	5,410
Hose and tubing *lbs.*	812	1,085
Other natural and synthetic rubber manufactures	.....	148
TOTALS	.....	$8,546
GRAND TOTALS, ALL RUBBER REEXPORTS	.....	$824,869

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

Compounding Ingredients — Price Changes and Additions

Accelerators, Organic

Accelerator 552 *lb.*	$2.00	
Santocure *lb.*	.64	/ $0.71

Accelerator-Activators, Organic

Emersol 110 *lb.*	.225	/ .2375
120 *lb.*	.23	/ .2425
130 *lb.*	.2525	/ .265
210 Elaine *lb.*	.23	/ .2575
Emery 600 *lb.*	.175	/ .2025
Hyfac 430 *lb.*	.22	/ .2325
431 *lb.*	.23	/ .2425

Bonding Agents

MDI-50 *lb.*	2.75	/ 3.25

Carbon Blacks

Philblack A (MAF) *lb.*	$0.0625	/ $0.105
O (HAF) *lb.*	.08	/ .124

Colors—White

Cryptone BT *lb.*	.09½	/ .10½
Lehigh, 35% leaded *lb.*	.16⅜	/ .17⅝
50 leaded *lb.*	.16⅞	/ .17⅞

Colors, Other Than White

Covinylblaks *lb.*	.62	/ 1.14
Mapico Black *lb.*	.1175	/ .12
Brown *lb.*	.1275	/ .13
Red *lb.*	.1225	/ .125
Tan *lb.*	.1975	/ .20
Yellow *lb.*	.10	/ .1025

Dusting Agents

Glycerized Liquid Lubricant (conc.) *gal.*	1.48	

Fillers, Inert

Albalith Lithopone *lb.*	.075	/ .085

Latex Compounding Ingredients

Aquablaks *lb.*	.0725	/ .1775
Aquarex D *lb.*	.80	
L Paste *lb.*	.94	
MDL Paste *lb.*	.33	
ME *lb.*	.97	
WA *lb.*	.28	
Pip-Pip *lb.*	2.00	
R-2 Crystals *lb.*	1.95	

Mold Lubricants

Glycerized Liquid Lubricant (conc.) *gal.*	1.48	

Plasticizers and Softeners

Bunarex Liquid *lb.*	.0425	/ .0555
Bunarex resins *lb.*	.065	/ .1225
Monoplex DBS *lb.*	.79	/ .90
DOS *lb.*	.69	/ .70
Paraplex AL-111 *lb.*	.32	/ .3275
Paraplex G-25 *lb.*	.84	/ .85
G-40 *lb.*	.48	/ .49
G-50 *lb.*	.425	/ .435
G-60 *lb.*	.445	/ .455
Picco resins *lb.*	.13	/ .185
480 Oilproof Series *lb.*	.18	/ .23
Piccocizers *lb.*	.04	/ .068
Piccovol *lb.*	.025	/ .038
RPA No. 2 *lb.*	.75	
No. 3 RO *lb.*	.49	
Rubber Oil B-5 *lb.*	.0225	/ .0355
Rubberol *lb.*	.2575	
Piccolastic resins *lb.*	.1855	/ .34
Piccolyte resins *lb.*	.185	/ .25
Piccoumaron resins *lb.*	.07	/ .185
Piccovars *lb.*	.145	/ .20

Reclaiming Oils

DiPolymer Oil *gal.*	.33	/ .43
Picco 6535 *gal.*	.25	/ .30
C-33 *gal.*	.215	/ .315
C-42 *gal.*	.23	/ .33
D-4 *gal.*	.27	/ .37
E-5 *gal.*	.25	/ .35
Q Oil *gal.*	.286	/ .386

Reinforcers, Other Than Carbon Black

Bunarex resins *lb.*	.065	/ .1225
Picco resins *lb.*	.13	/ .185
Piccolyte resins *lb.*	.185	/ .25
Piccoumaron resins *lb.*	.07	/ .185
Piccovars *lb.*	.145	/ .20
Pliolite S-3, -6, -6B *lb.*	.41	/ .48
S-6 Masterbatches *lb.*	.42	/ .69

Solvents

Picco Hi-Solv Solvents *gal.*	.17	/ .24

Synthetic Rubbers and Latices

Chemigum 30N4NS, 50N4NS *lb.*	.50	/ .57
N1NS *lb.*	.64	/ .71
N3NS *lb.*	.58	/ .65
Neoprene Latex (dry wt.)		
Types 60, 601, 601A, 735 *lb.*	.38	/ .49
571, 842, 842A *lb.*	.35	/ .46
572, 700 *lb.*	.36	/ .47
Neoprene Type FR *lb.*	.80	/ .83
GN, GN-A, S *lb.*	.38	/ .41
RT, W *lb.*	.40	/ .43

Tackifiers

Bunarex resins *lb.*	.065	/ .1225
Picco resins *lb.*	.13	/ .185
Piccolastic resins *lb.*	.1855	/ .34
Piccolyte resins *lb.*	.185	/ .25
Piccoumaron resins *lb.*	.07	/ .185
Synthol *lb.*	.2475	

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Continued

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RELIABLE CHEMIST, B.S., ASSISTANT TO CHIEF CHEMIST in pressure-sensitive adhesive tapes, adhesives from rubber, from lacquer, from polymers, resins. Vinylite coatings, quarterlining, laminating cements. Extensive and excellent practical experience. Go anywhere. Address Box No. 705, care of INDIA RUBBER WORLD.

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SPECIAL: 1 THROPP 10 x 24 MILL, COMPLETE WITH MOTOR and drive. 2 Ball & Jewell stainless Rotary Cutters #1½ with 30 H.P. motor. 1 Banbury Mixer. 1—32" x 45" single-opening Hydraulic Press, 24" ram. Also Tubers, Vulcanizers, Calenders, etc. Send us your inquiries. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York 7, N. Y. Phone: BArclay 7-0600.

FOR SALE: BANBURY MIXERS, MILLS, CALENDERS, LABORATORY Mill and Banbury Unit, Extruders, Tubers, Hydraulic Presses. Send for detailed bulletin. EAGLE INDUSTRIES, Inc., 110 Washington Street, New York 6, N. Y. DIgby 4-8364-5-6.

FOR SALE: SHERIDAN #17 EMBOSSING PRESS (54 x 26) with automatic feed and rewind attachment and automatic dwell attachment. Used only one month. Address Box No. 701, care of INDIA RUBBER WORLD.

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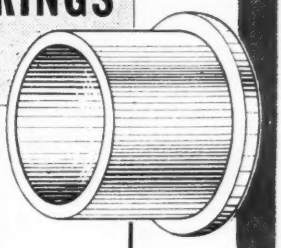

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(*Classified Advertisements Continued on Page 504*)

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CLASSIFIED ADVERTISEMENTS

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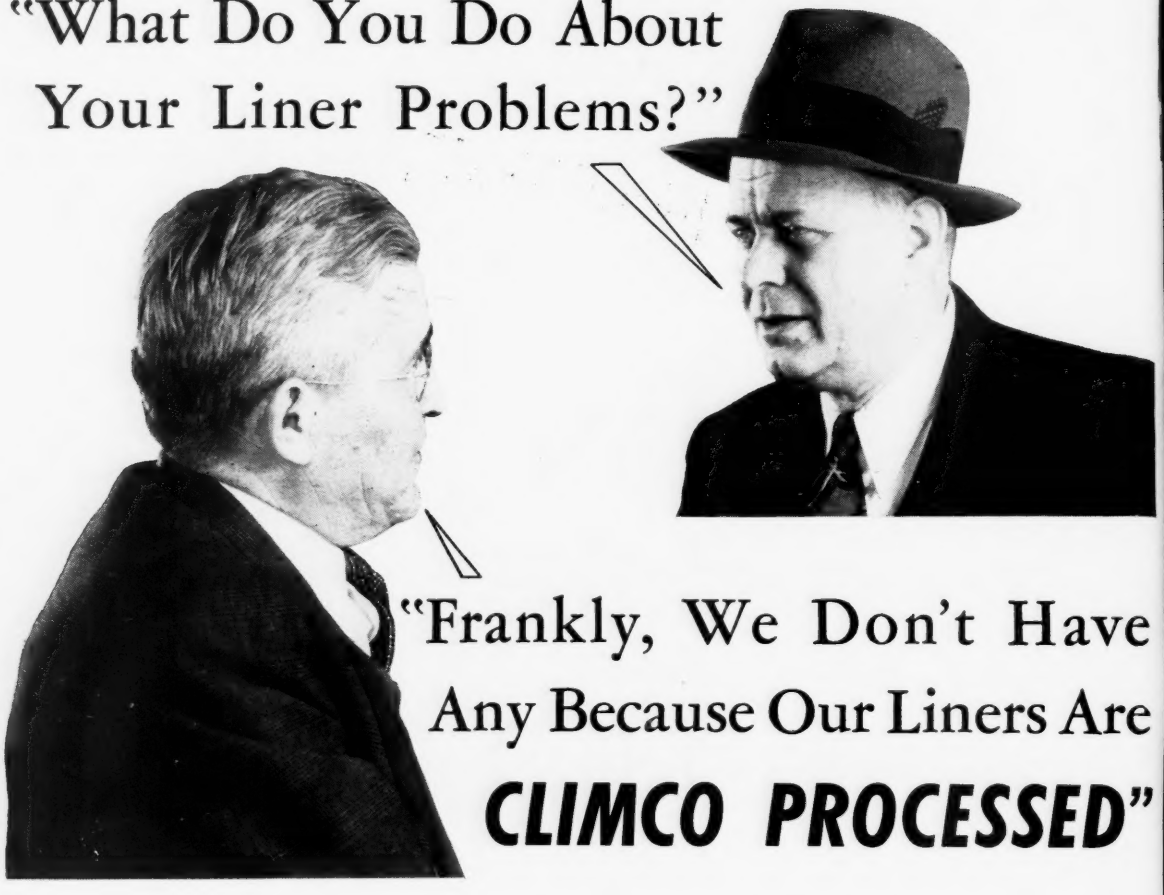

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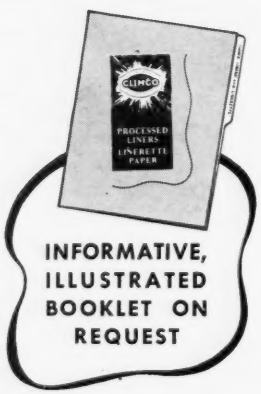

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